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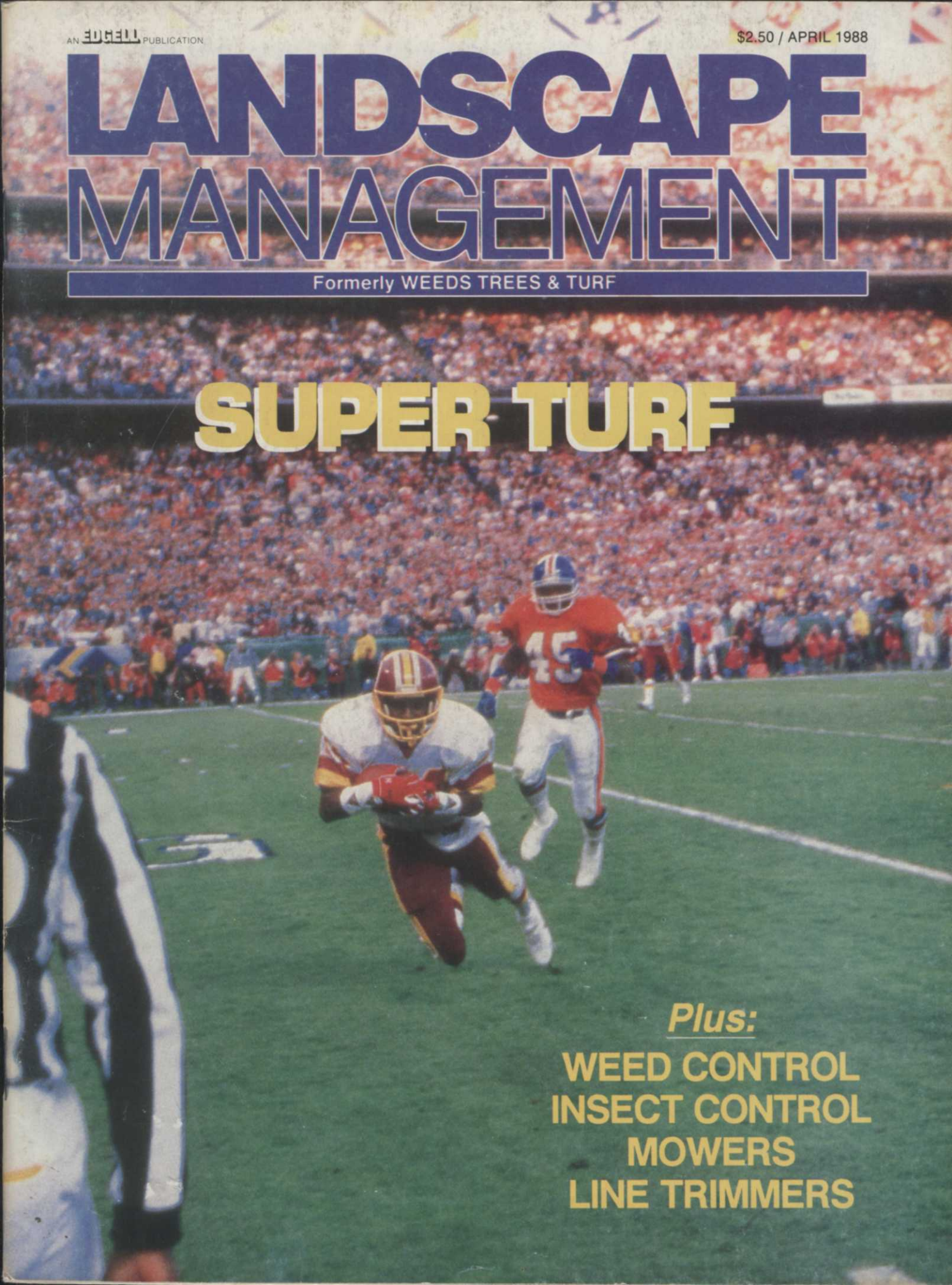
LANDSCAPE MANAGEMENT

Formerly WEEDS TREES & TURF



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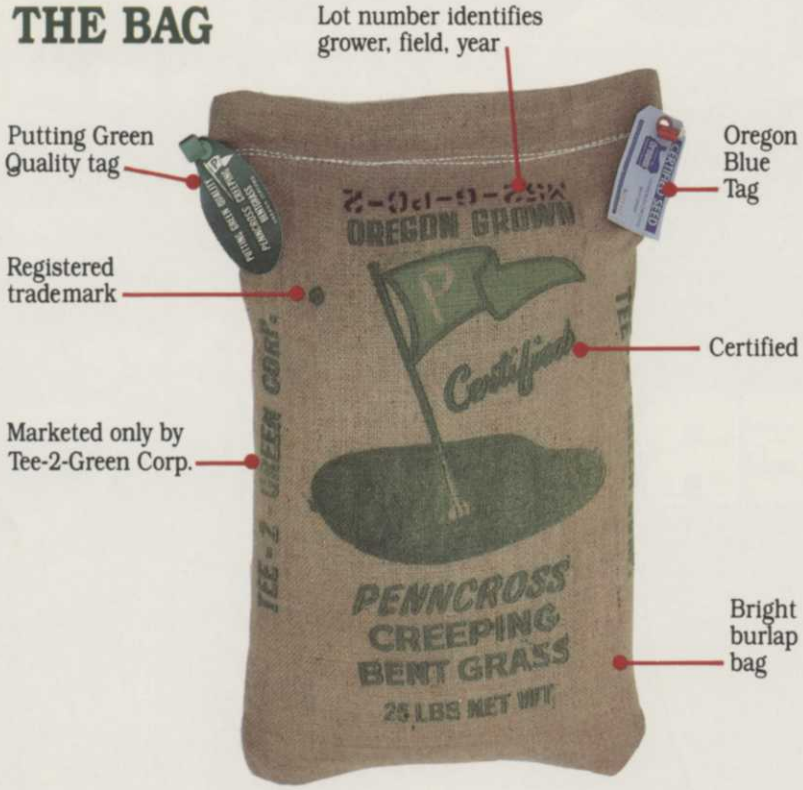
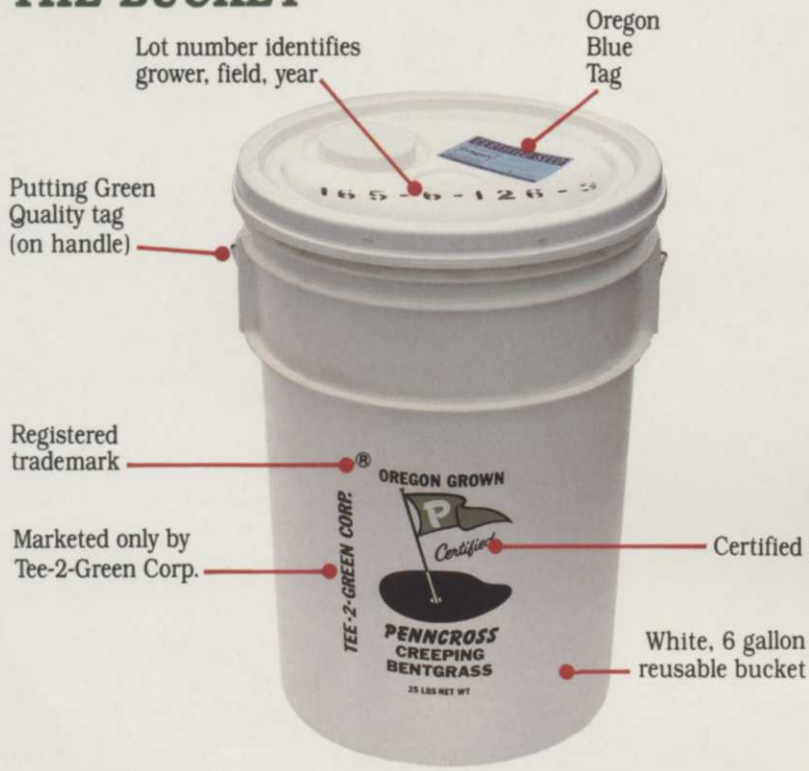


THE BUCKET



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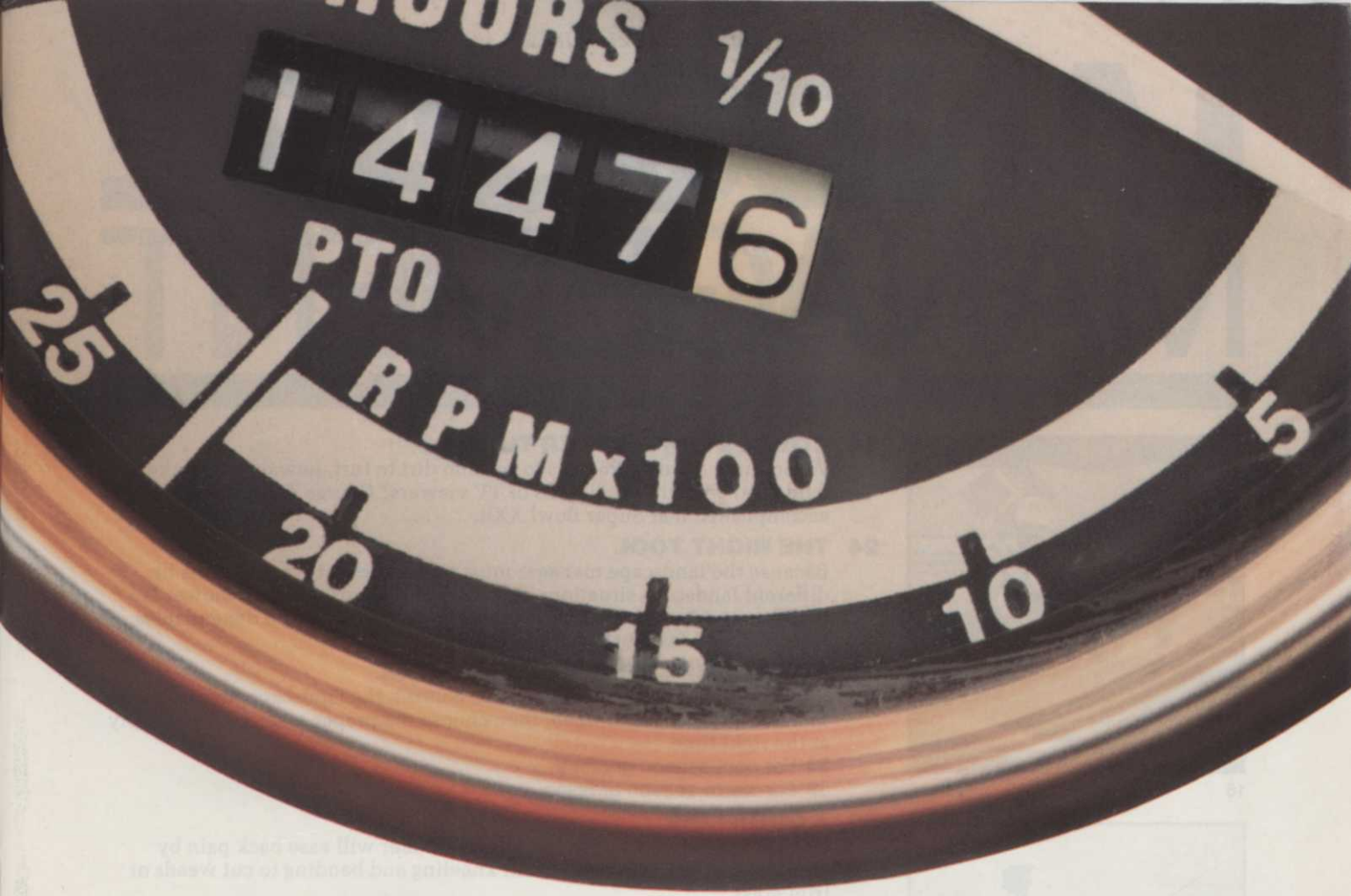

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Source: *National Farm & Power Equipment Dealers Association Official Guide*, 1979 original list prices from Spring 1980 edition, resale value Fall 1987.

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It might not get you a date, but a line trimmer will ease back pain by eliminating the need for stressful kneeling and bending to cut weeds or trim grass.

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New in insect control: the spittlebug, high-pressure injection systems and biotechnology. This guide offers old stand-by cures and new advances in insect control.

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Although the turf is what you see, you might have to get to the root of your problems throught the soil.

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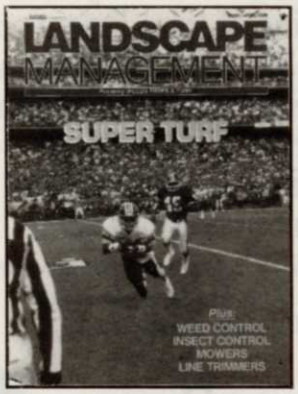

On the cover: Action at the Super Bowl, reproduced with permission from 'Sports Illustrated' magazine.

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Fertilizer prices rise. . . .

■ Fertilizer prices have gone up anywhere from five to 10 percent this year, after a two-year fall. A *Lawn Care Industry* survey of suppliers reveals bulk urea prices have jumped 20 to 30 percent in the last six months, meaning a five to 10 percent increase for finished products, depending on urea content. Raw material bulk prices fell five to eight percent last February through April. This year, they jumped 22 percent in a similar period.

. . . .while LCO pesticide use appears down

■ A trend appears to be developing in the chemical lawn care industry away from the use of pesticides. ChemLawn, the country's largest such company, expects to start using biological insect controls on customers' lawns within two years, a report in *Organic Gardening* claims. ChemLawn scientists are studying nematodes and other biologicals for use against lawn pests.

And Davey Tree & Lawn Beauty, in a press conference Feb. 29 in Cleveland, announced its intent to use considerably fewer pesticides in 1988 (see "Green Industry News").

Architect sees golf growth continuing

■ Landscape architect and golf course designer F. Truitt Rabun, Jr., of Edward Pinckney/Associates, Ltd., agrees with National Golf Foundation figures painting a rosy picture for the future of golf, especially in construction of golf course communities. Golf will grow in relation to residential development in order to increase the value of land, he says, sometimes as much as $20,000 to $30,000 per lot.

Also, community leaders, especially in southern metropolitan areas, are calling for more country clubs because existing ones are full. A factor in drawing business to an area is the availability of country club membership for executives. "Community leaders are pulling for new country clubs for these newcomers," Rabun says.

Rabun

Another trend Rabun sees: a need for more public courses built by private developers, based on demographics and profit potential. Courses will be more suited to new players, retirees and women. He cited quality of tee placement as an example in the case of women. Lower maintenance costs and less management-demanding designs. "The pendulum is swinging," he says. Designs will pay more attention to land form and existing vegetation, and thus be less expensive to maintain.

Rabun spoke at the first Southern Grounds & Turf Maintenance Expo in Myrtle Beach, S.C. in February.

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RIGHTS-OF-WAY

Landscaping lures developers and tenants

In California's Silicon Valley, where competition for new industry is intense, the City of San Jose is building roads with attractively landscaped median strips to enhance land value and help lure developers and tenants.

In one such median strip project, on a 1.5-mile extension to Hellyer Avenue in South San Jose, the Oakland-based landscape architecture firm of Singer & Hodges has created an instant landscape, using 36-inch boxed trees and other large specimens.

But the landscape would not have flourished for long in the native serpentine soil, a real problem on the northern portion of the project, says landscape architect Ron Hodges. With too little calcium and too much magnesium, the soil stunts plant growth and distorts foliage.

B&B Landscaping of Mountain View, which installed the landscape, removed 12 inches of subsoil, says Hodges. "They ripped the bottom and added gypsum. The calcium in the gypsum displaces the excess magnesium."

An irrigation system was laid and a new soil mix imported. Hodges specified a sandy loam topsoil and CompGro, a sewage sludge-based soil amendment produced by the East Bay Municipal Utility District at its wastewater treatment plant in Oakland. A composted mixture of organic solids and fir and cedar bark chips, CompGro contains high amounts of humus needed for building good soil structure. It also adds nitrogen, phosphorus, potassium and essential minerals to the soil.

The medians were mounded in the middle, sloping gently to the edges. Explains Hodges: "We wanted to maximize the amount of soil so that the plants—particularly the coast live oaks—would be well-established before hitting the serpentine subsoil." To protect the oaks from excess moisture, the landscape architects designed a subdrainage system, with a perforated drain to each tree.

"Since the oaks are slow-growing, we used 36-inch boxed specimens to make an immediate impact. Everything else we planted was in scale with that," Hodges says.

Where it is difficult to maintain ground cover, Hodges opted for seeding a drought-resistant tall fescue.

Plantings throughout the project are drought-tolerant.

Shown above is a strip of right-of-way along Hellyer Avenue in San Jose that was designed to attract industry and residents to the area. This tract was designed by Ron Hodges of Singer & Hodges.

PESTICIDES

EPA kills special review of 2,4-D

The Environmental Protection Agency will not conduct a special review of 2,4-D because further research could not confirm suspicions that it causes cancer.

EPA spokesman Al Heier said additional studies suggest 2,4-D is not a carcinogen. "Some of the best toxicologists in the country looked at the data" and could not verify the link between 2,4-D and human cancer.

The possibility of a special review arose in 1986 after release of a National Cancer Institute (NCI) study of Kansas farmers using 2,4-D more than 20 times a year and mixing their own formulations. The study said farmers were eight times more likely to contract non-Hodgkins lymphoma, a cancer of the lymph systems.

However, a followup study by NCI in western Washington found no increased incidence of cancer.

The EPA decision averted the possibility of new label restrictions or a banning of the herbicide.

"This is probably the best news I've heard in a long time," says Doug Fender, executive director of the American Sod Producers Association. "The significance of an effective herbicide on a sod farm cannot be overstated."

EPA will seek out long term studies of the effects of 2,4-D done by universities or manufacturers. "We will be asking registrants (2,4-D manufacturers) to conduct some additional long-term studies," adds Steve Johnson, deputy director of EPA's pesticide hazard evaluation division.

The *New York Times* quoted staff scientist Diane Baxter of the National Coalition Against the Misuse of Pesticides (NCAMP) as calling the decision "outrageous," saying that results of the human studies conducted by the NCI should outweigh animal studies which the EPA has referenced.

In the meantime, EPA has classified 2,4-D as a Category D pesticide, one which displays no evidence of human carcinogenicity.

LAWN, TREE CARE

Davey to reduce pesticide applications in tree and lawn care by up to 80 percent

The Davey Company of Kent, Ohio, will reduce the use of traditional pesticides by 75 to 80 percent in tree, shrub and lawn care services by 1990.

"We will realize over 30,000 gallons of pesticides that will not be applied in 1988," says Roger Funk, Ph.D., vice-president of technical and human resources. "We will realize that without reduced control and with no additional cost to the customer."

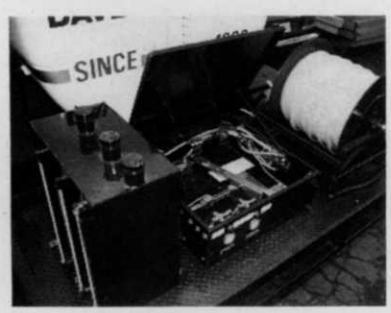
The company began what it calls its Plant Health Care concept in 1987. In five test territories, use of traditional pesticides on trees and shrubs were reduced by 50 percent. And use of herbicides and insecticides on turf were reduced by 40 and 50 percent, respectively.

"There are alternatives which are acceptable to the American public in terms of pesticide use," says Funk.

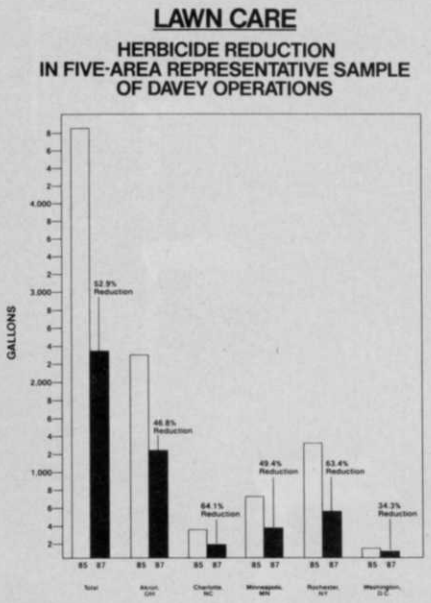
Davey surveyed 10,000 customers and found that they want less pesticide use, no more pests and no increase in prices. Funk and other Davey executives believe that the Plant Health Care concept is the answer to customer wishes.

One key development in pesticide reduction resulted when Davey researchers mixed soaps with reduced amounts of pesticides. They found that soaps not only control pests, but also appear to act as an adhesive, adhering the reduced levels of pesticides to leaves longer, providing a residual effect. To achieve further pesticide reductions, Funk and his staff are continuing to test alternative products like mineral, neem and citrus oils; and natural pesticides derived from plants such as rotenone and pyrethrum.

"We're going to increase the use of horticultural oil in summertime," notes Funk. "And I'm extremely impressed with the results we've seen with neem oil."



The patented "Customizer."



Funk is likewise high on soaps for insect control. Says he: "With some insecticides, we've found that we can reduce applications to 1/16th of the original, mix with soaps and get the same level of control. In a petrie dish, the soaps will control all known species of lawn insects."

Funk adds that nematodes "look extremely promising."

Other techniques being used by Davey to reduce pesticide use are special pesticide timing charts keyed to the host, its "Customizer" spray injection system and low-drift spray equipment.

At presstime, Davey was considering marketing its "Customizer" to the lawn care market. The patented spray unit is specially designed for spot application of pesticides. Pesticides are not tank-mixed, but are secured in a separate reinforced tank and are injected in the fertilizer line only as needed. Another feature of the unit is a no-drift nozzle.

"It's not only the 'Customizer,' but it and the nozzle together that make it unique," Funk told a special press conference last month in Cleveland.

Brian Jeffers of Davey has invented a tree spray gun whose pressure can be adjusted by the technician at the gun without having to return to the truck. Use of this gun makes it easier to go from large trees to small shrubs or vice versa without worry of excessive drift.

The bottom line? Less pesticide use. Look at these figures:

Before implementation of the Plant Health Care program, Davey had projected the use of 27,900 gallons of tree pesticides in 1988. Since the move to PHC, that estimate has been downgraded to 6,900 gallons. Davey had planned, pre-PHC, to use 16,000 gallons of turf herbicides; now, they're figuring on 7,600 gallons. And the company had plans for 3,300 gallons of turf insecticides before PHC; that estimate is now 1,930 gallons.

One of the most important factors in making total Plant Health Care work is educating the customer, Funk believes. "Education is the greatest service we provide to the customer. Beginning in 1988, we will take a more pro-active approach to education." He notes that Davey lawn technicians may even offer to adjust customers' lawn mower cutting heights this summer.

Davey president Dave Cowan concluded the press briefing with this:

"We're not doing this to save money or to make money. We're doing it because we believe in it."

Funk

INDUSTRY

'Get off our duffs,' says Eliot Roberts

Turf is a multi-billion dollar industry. In fact, it is valued nationally at about $25 billion. That's the good news.

Eliot Roberts, Ph.D., executive director of the Lawn Institute, says the value of the turf industry can be assessed in four ways:

1. Facilities—golf courses, parks, cemeteries or home lawns.

2. Manufacturing—mowers, fertilizers and chemicals.

3. Services—consulting, USGA specialists or commercial

continued on page 14

Keep your fairways looking great.

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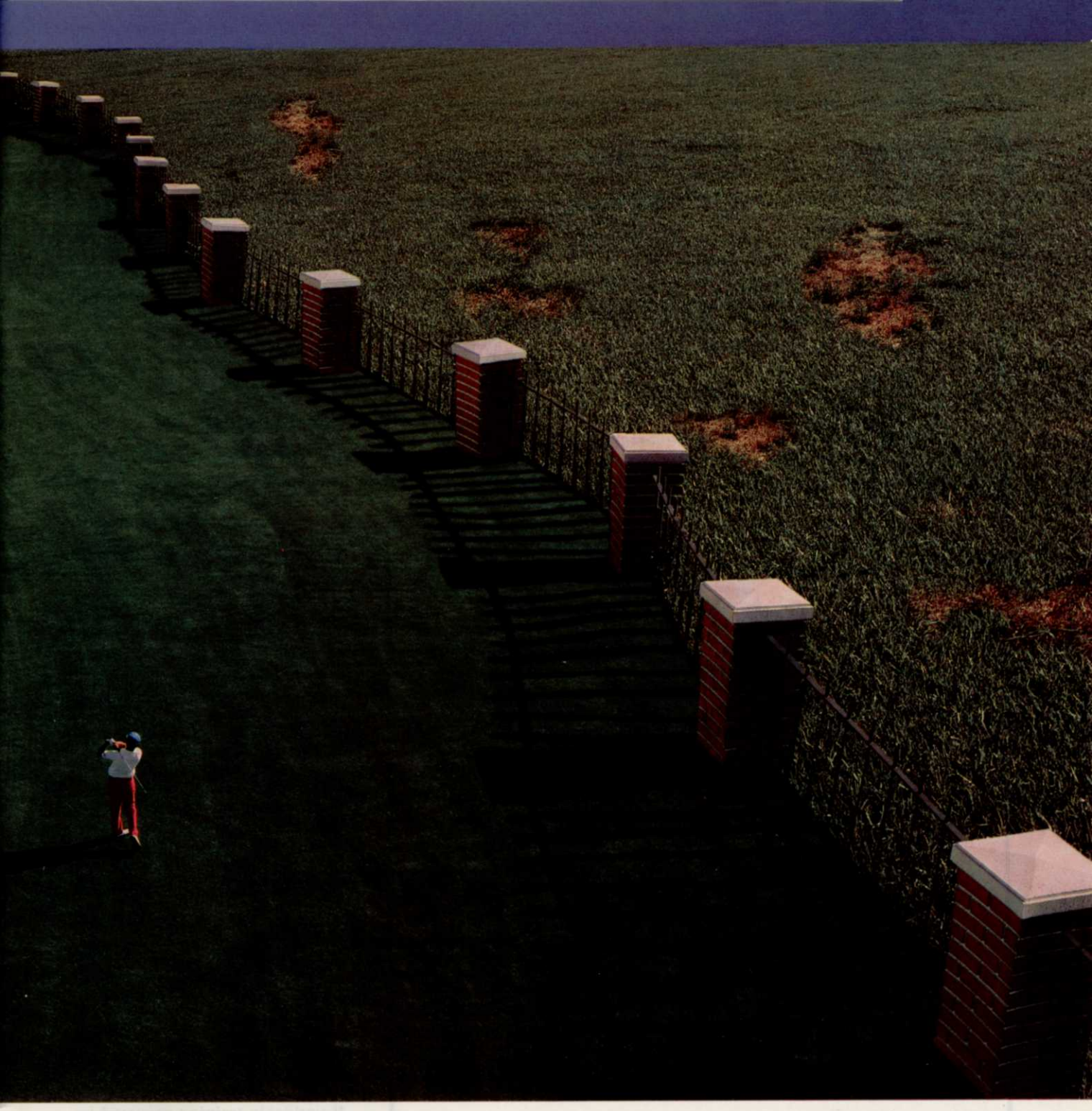

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SHORT CUTS

ENDANGERED LABELING... Chemical producers should realize by now that quick action on an EPA judgment is sometimes folly. Such is the case with endangered species labeling. Since it has become unlikely the endangered species program will be in place by this September, the EPA is issuing three options, according to a report in *Pesticide & Toxic Chemical News*. First, products already with new labels can be used until the product is gone. Second, stickers can be placed over language required by PR notices 87-4 and 87-5. Third, use labeling approved prior to issuance of those to PR notices. Stay tuned.

IT COULD HAPPEN... Fire can devastate a maintenance operation, as Scott Wallace, superintendent at Waveland Golf Course, in DesMoines, Iowa knows. After it happened to him, he learned some valuable lessons. His advice: store equipment and chemicals in separate areas...keep a good inventory, especially all equipment receipts for anything you still use...keep records in two different areas.

CONGRATULATIONS...to Dr. Eliot Roberts, executive director of the Lawn Institute. Roberts received the Iowa Turfgrass Institute's Meritorious Service Award. Roberts started some of the first research plots at Iowa State University.

PRUDENT PRUNING... Be careful when you prune wild cherry or black locust trees near a pasture. The branches are poisonous to animals which eat them, says John Mead, extension agent at Rutgers University's Cook College. According to Mead, the branches become more dangerous as they dry out.

REINCO CONSOLIDATES... Reinco, Inc. a New Jersey-based manufacturer of hydrograsses and power mulchers, has anounced the dissolution of its 20-year-old sister company, Grass Growers, Inc. Grass Growers produced Terra Tack tackifier used to minimize erosion. Information on the availability of Terra Tack trademark can be obtained by calling 800-526-7687.

SHRINKING POOL... The labor pool for young adults is shrinking—not a good sign for service-oriented industries like lawn and tree care and landscaping. According to National Arborist Association executive director Bob Felix, there will be 24 million 18- to 24-year-olds entering the job market in 1990. This compares with 30 million who entered in 1980. Competition for these people will be intense; Felix believes that the green industry should be prepared to pay for its share of the market.

NEWS *from page 11*

representatives.

4. Institutional—university research and extension.

The bad news, however, is that the general public doesn't realize the worth of the turf industry, Roberts says. "We need to get off our duffs and educate people," he says. "The production of seed and sod is a marketable commodity, but there's value to us in using it, not just how it's produced."

Roberts spoke at the Iowa Turf conference.

REGULATIONS

OHSA revises its trimming regulations

The Occupational Safety and Hazard Agency (OSHA) revised its regulations concerning trimming trees in the proximity to telephone, cable vision and other communication lines, including house drops.

Through the efforts of the National Arborist Association, previous requirements for extensive safety training record-keeping were dropped. The new regulation, effective Oct. 28, 1987, allow simple training certification.

Employers retain the right to provide this training exclusively on the job. The new requirements state in part: "Employers shall provide training in the various precautions and safe practices required to trim trees in proximity to telecommunications lines. Such training shall consist of on-the-job training or classroom type or both.

"The employer shall certify that employees have been trained by preparing a certification record which includes the identity of the person trained, the signature of the employer or the person who conducted the training and the date the training was completed. Such record shall be maintained on file for the duration of the employee's employment."

If verifiable training occurred before the new regulation, then further training is not necessary. Training includes the following:

"1) Recognition and avoidance of dangers relating to encounter with harmful substances and animal, insect or plant life;

"2) Procedures to be followed in emergency situations; and

"3) First aid training, including instruction in artificial respiration where appropriate."

For complete details on the new regulations, contact OSHA or the NAA at P.O. Box 1094, Amherst, NH 03031; (603) 673-3311. **LM**

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COVER STORY

SUPER TURF

When there are only 25 days to go from dirt to turf, how do you make a field good enough for millions of TV viewers? George Toma and his crew accomplished it at Super Bowl XXII.

by Heide Aungst, managing editor

The best story to come out of Super Bowl XXII certainly wasn't the game between the Washington Redskins and Denver Broncos. It was the one about the dead pigeons.

Haven't heard that one yet?

The *L.A. Times* carried an article about dead pigeons on the field at Jack Murphy Stadium. California environmentalists pointed to turf pesticides as the culprit.

It turns out the pigeons were dead long before they even reached the field. NFL athletic field manager George Toma got the frozen birds from a veterinarian to scare live pigeons away from eating the pre-germinated seed.

For the most part, it worked. At least enough to let the Ph.D. ryegrass mixture from International Seeds sprout.

The January 31st game was Toma's 22nd Super Bowl. Toma normally cares for the Kansas City Royals' and Chiefs' synthetic game fields and natural practice fields.

Pre-game pressures

"Hug the wall!" Toma yells at a pre-game performer taking a shortcut across the field. Thousands of pre-game and half-time performers swarm the stadium for rehearsals two days before the game. "This is a groundkeeper's nightmare. I think we counted 600-plus wheels going over this place...2,000 performers..."

Toma covered the field with a plastic tarp, under which was Warren's TerraBond to protect heavily trafficked areas.

Toma brought a crew of 12 from Kansas City. Included were the crew's business manager Chip Toma, and foremen Scott Martin, Andre Bruce and Doug Schallenberg. San Diego field manager Brian Bossard and a crew of eight also worked on the field.

The turf was a mere 25 days old for the NFL championship game. Sportscasters blamed a fall in the first quarter by Washington quarterback Doug Williams on the field conditions. "The Redskins complained because they had to use longer cleats," Toma said. "But the Broncos said they had to wear shorter cleats."

When Toma took charge of the

Jack Murphy Stadium before Toma's crew worked on it.

field, it was almost bare after the Chargers and San Diego State football seasons, a high school football tournament and the Holiday Bowl. Dormant Bermudagrass covered only the sides of the field.

"It was sodded in the spring with Santa Ana," Toma explained. "The Bermuda took a Trailways bus someplace. My men kept on talking that we maybe should sod."

Starting from scratch

Sodding would have been simpler but more expensive. Toma decided to seed.

The San Diego field has a four-foot sand base. But clay from a previous sodding error layered the top inch. The clay, in essence, saved the day. It gripped the roots of the seedling turf better than pure sand.

Toma took over New Year's Day. First, his crew removed the paint in the end zones with Jacobsen sweepsters and sucked up the old paint with a Turf Vac. "We had to take the paint off the numbers because they weren't up to NFL specs," Toma said. "They have to be 12 inches from the line. I noticed it on TV. A couple of other clubs will have to be reminded of it next year."

They swept the field with a Parker sweeper about the time they began to pre-germinate the seed in barrels. "We usually change the water twice a day, but some days we'd drain it and not put the water back in. We pre-germinated at different stages."

While the seed germinated, the crew tackled the field. "I couldn't use a verticutter or there'd be nothing but dirt," Toma said. He wanted a Meeker harrow to prepare the seed bed, but had to settle for an old Rogers aero-blade seeder.

"Then we seeded like a golf green with 2,000 pounds of seed," Toma said.

Toma's son Chip prepared the the seed concoction. His recipe is described as "a pinch of this, a dash of that—about half a shovel-full of Milorganite, a big shovel of pre-germinated Ph.D., then Turface" in Lesco and Scotts spreaders.

The next day, Toma used a Core Master aerifier with 5/8-inch solid tines set for 3/4 to 1 inch depths. The tines pushed the seed into the field.

"We put 72 holes per square foot," Toma said. "Then we seeded again. If I had to do it again, I would have used 3/4-inch tines at a depth of 3 1/2 to 4 inches. That would have made 142 holes per square foot."

The seeding/coring/seeding process causes turf roots to grow at different levels in the field. The seed sprouting in the holes will have young roots starting at the one-inch depth.

That night it rained just the right amount—15/100 of an inch to be exact. Two days later later the crew top dressed the field with two parts nitrohumus to one part sand.

The crew covered the field the next day with 24 rolls of 40 x 100 ft. six-mil plastic. Then they pulled a pinspiker with a three-gang mower over the plastic to allow the turf to "breathe."

Within six days, the ryegrass had grown to 1 1/2 inches. "I called up Doc Watson (agronomist Jim Watson, Ph.D., of Toro) and he said, 'George, slit that canvas from goal post to goal post and take it off from 10 to 2:30,'" Toma said.

The seventh day after seeding, the crew mowed the field. By the week before the game, they mowed every other day. They sprayed the field with Ferromec and Bovura to green-up the color. "You see a big difference with iron," Toma said.

The rest of the time was spent with details such as painting the fields and sidelines for ABC-TV's cameras, putting up goal posts, and putting about 2,000 feet of windscreen around the practice fields to block out fans and scouts.

The boss

"Off the field now!" George yells while pulling back the plastic tarp. "We have a ball game to play."

continued on page 18

LM managing editor Heide Aungst and field manager George Toma check out how well the field held up after Super Bowl XXII.

The 'recipe' of pre-germinated seed, Milorganite and Turface was put on the field by spreaders.

George and Chip Toma discuss field strategy while Chip paints.

"Give me a half-hour more," the ABC producer yells back. "The show takes 12 minutes, you've got 12 minutes," Toma says.

By this time, it's 8:45 p.m. The crew has been at the field since 6 a.m. and they're eager to return to the hotel.

Thousands of sock-footed (Toma doesn't allow shoes on the field) Jazzercisers, piano players and Rockettes do a final half-time run-through and scurry off the field. The crew pulls the tarp back to reveal bruised turf and a field rutted from the wheels on movable stages. The crew hand-sweeps rutted areas. Around 11 p.m. they finally leave the field, having had only Oreos for dinner.

At 6 a.m. the next day, the crew is at the field again to remove the tarps. "The tires (on the stages) should have been twice as wide as they were," Toma says, slightly upset. "Just one of those weighs 4,000 pounds...two baby grand pianos, two people playing, six to eight girls dancing...These people never did this before. They're used to dancing in New York on a stage."

Next, the ruts are patched. "I take my hat off to the Ph.D.," Toma says. "I also take my hat off to my crew and Brian Bossard's crew. Today they're not walking, they're running."

After mowing the field at 5/8ths of an inch, they roll it with two people on the back for added weight. Next, the entire field is re-painted, using large stencils for the numbers and logos.

George's crew is slowed a bit by an insert sportscaster Frank Gifford had to tape. They can't get in the way of the cameras.

On Sunday, the crew meets in the hotel lobby before 6 a.m. They pile into a van and car and head to Denny's restaurant. "This might be the last time we eat for awhile," warns Chip. George sits by himself, reading the morning paper. The rest of the crew talks about the field, the game and the Pro Bowl (where several will head Monday morning after the game). "Can you imagine what it would be like if could sleep in and pop open a beer, watching the game from the couch?" one says.

Super day

By 7:30 a.m. they're on the field with the Parker Sweeper and paint sprayers. By 8 a.m., the crew rakes and sweeps the field.

Toma walks the field up and down, over and over again, occasionally shouting instructions to crew members.

After sweeping the field so the turf stands up, they mow it twice at 5/8 inches with a John Deere greensmower.

At 12:40 p.m., the crew emerges from the maintenance area in crisp

George Toma in front of the pre-Super Bowl field.

Doug Schallenberg and Scott Martin hand-sweep the field to bring the turf upright before mowing.

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San Diego field manager Brian Bossard and George Toma oversee the workings of their combined crews.

The entire crew is needed to roll the tarps off the field.

new red-white-and-blue warm-up-suit uniforms. ABC grabs George for a pre-game interview. Proudly, he talks about the 25-day-old ryegrass before a national audience.

The pre-game show goes well. Kick-off is at 3 p.m.

The crew waits patiently with photographers by the Bronco bench. They can't really enjoy the game, because they must be ready to run onto the field to replace divots as needed.

At the half, with the Redskins leading 35-10, the crew sweeps, rakes, replaces divots and picks up trash.

After the Redskins complete a 42-10 pounding, the crew breathes a sigh of relief. It's kind of like Christmas. All that preparation and then, in a matter of hours, it's over. But they won't have much clean-up: the field will soon be torn up by a motocross event.

Fans clear out. Toma walks the field one last time. "I've never seen 25-day-old grass hold up this well," he says.

The crew leaves the field around nine, posing for a group picture outside the van. "I'm proud of you guys," Toma says.

The Redskins weren't the only winners at Super Bowl XXII. **LM**

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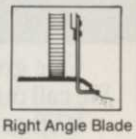
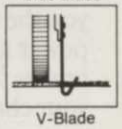


Right Angle Blade



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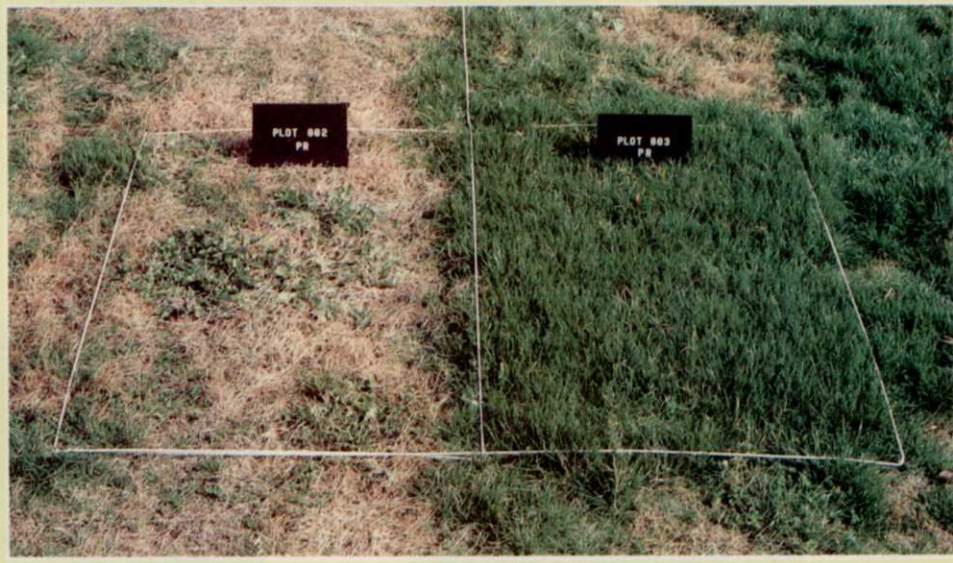

Left, insect damage in perennial ryegrass. Right, endophytic ryegrass resists insect pests.

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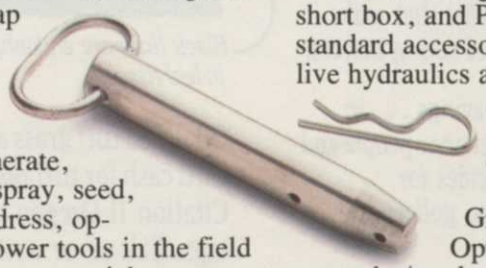

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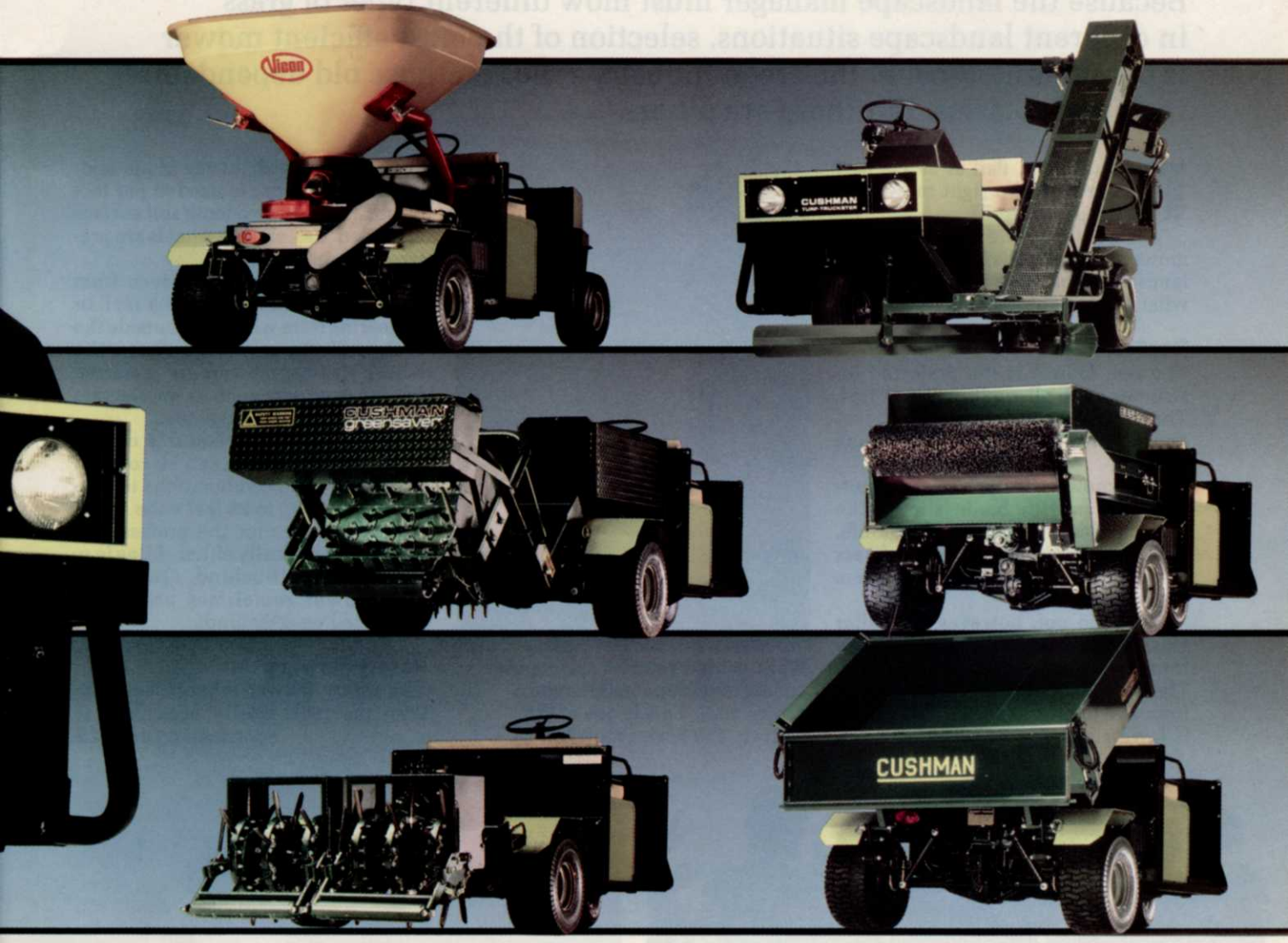

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THE RIGHT TOOL

Because the landscape manager must mow different types of grass in different landscape situations, selection of the most efficient mower is paramount. Most of the green industry relies on those old dependables, reels and rotaries. But there are others.

Reel, rotary, flail or sickle bar? Which is the right mower for the job at hand?

Each of the four different types of mowers is best adapted for certain landscape jobs. Here is a run down on what mower is best for what situation.

Reel mowers

The reel mower is the preferred instrument for all quality (fine) turf. This includes golf course greens, tees and fairways, and the finer home lawns.

Reel mowers feature a scissor cutting action with blade slicing the turfgrass leaf off against a bedknife. Reel mowers do not rip the turfgrass plant, as do the other types of mowers listed here.

Reels do not, however, cut taller grasses. Heights of cut generally range from two inches down to 0.2 inches. The number of blades should increase from five to nine as the cutting height is lowered, say most manufacturers.

Walk-behind rotaries are popular among landscape maintenance contractors. This is one of the Gravely Pro Series mowers.

Though only about one to one-and-a-half horsepower is needed per foot of cut, a relatively smooth soil surface is needed. Caster-type wheels are preferred for better cuts.

Reel mowers can be driven from power applied directly to the reel, or by gearing from wheels set outside the reel, or from a roller behind the wheel. Heavier mowers are preferred for dense grasses such as zoysiagrass and certain Bermudagrasses.

One of the nicer features of reel mowers is that gangs can be coupled in 3- to 11-gang combinations to provide a cut of up to 26 feet wide.

Reel mowers for the professional market are basically either riding (e.g. triplex) or pull-behind. Owners of small lawns sometimes prefer the motorized walk-behinds.

Rotary mowers

The rotary mower is more versatile than the reel, mostly because it is

continued on page 26

Walk-behind reel mowers, like this John Deere 22R, are used for many golf course greens.

Riding reels, like this Toro, are also used on greens.

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Reel mowers, like this Jacobsen five-ganger, are perfect for golf course fairways.

more adaptable to rougher conditions. Unfortunately, though, the rotary mower does not make as good a cut on the turfgrass plant.

Rotary blades, travelling at high speeds horizontal to the soil surface and vertical to the leaf blade, cut when their impact upon the leaves split them with a tearing action. Thus, the rotary increases the degree of mutilation and injury to leaf blades.

This type of mower, however, has its many disadvantages—not the least of which is its economy. The popular rotary can reduce tall grass, fallen leaves and weeds to mulch. It does not jam on small twigs, though it will scalp on uneven surfaces.

Cutting heights range from two to 12 inches. This mower does not perform well at cutting heights below one inch, but cutting height adjustment is far easier than that for reel mowers. Cutting widths generally begin at 21 inches for single-bladed units and go up to 27½ feet for multiple-spindle units.

The rotary is preferred with grasses which readily form seedheads, like bahiagrass, St. Augustinegrass or carpetgrass.

One final thing to remember about rotary mowers: because of the high lateral speed of the blades, there are attendant dangers involved with high-speed debris, though mower manufacturers have provided every safety feature to deal with this problem.

Flail mowers

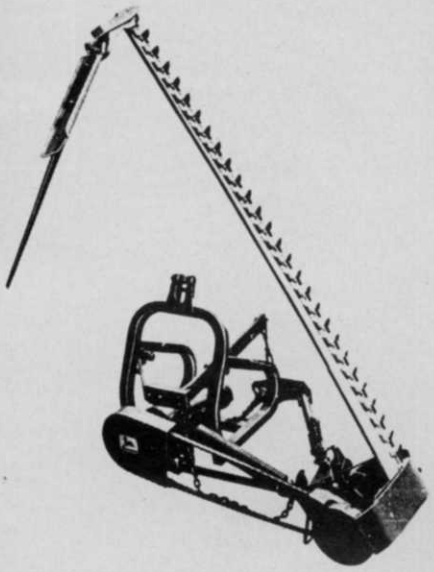
Flail mowers are not used in quite as many landscaping situations as reels or rotaries, though they may be responsible for more acres cut per year in this country.

Flail mowers are, by and large, used in big-scale situations such as parks and rights-of-way. They involve individual vertical blades hooked loosely onto a rotating (more than 500 rpm) horizontal shaft. Like rotary blades, flail blades cut on impact.

Unlike rotary blades, however, since the flail blades are loosely hinged, they will not throw objects from the deck with any force, giving this type of mower a high safety factor.

Thin blades are preferred for a finer cut, but thicker blades are also available. One of the drawbacks to a flail mower is that, because of their number, blade-sharpening is often a time-consuming process.

Flails, usually mounted to the rear or side of tractors, are for use in stony



Sickle bar mowers are attached to the side of tractors.

This Hustler riding rotory can fit through narrow openings.

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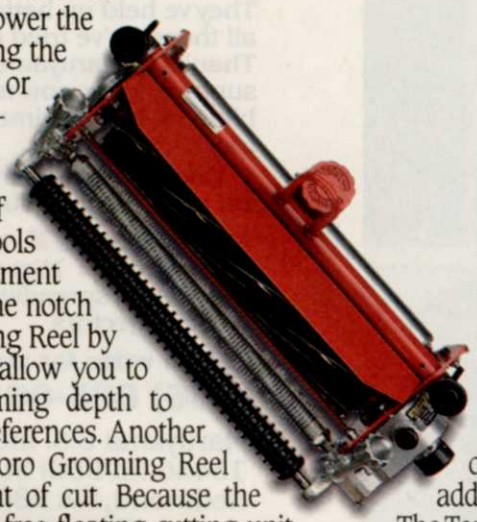

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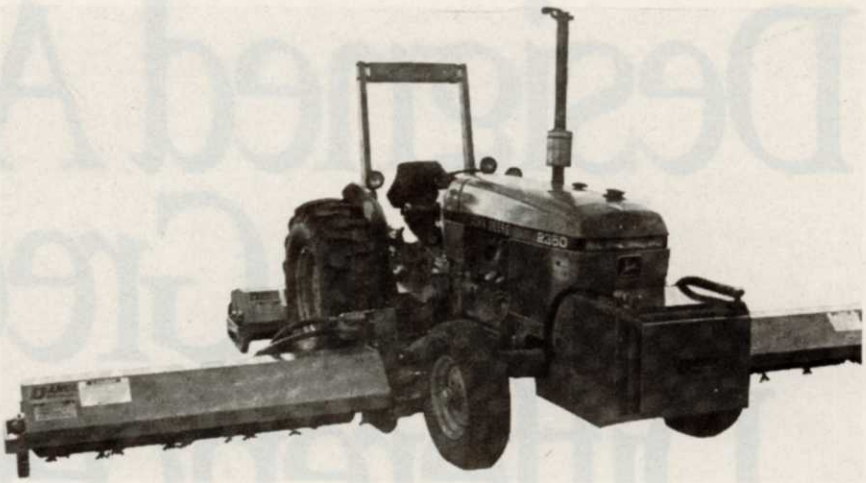


Flail mowers, like this Dandl Triple D, are capable of handling the toughest jobs.

or irregularly-contoured areas. They can handle leaves and tall weeds, and reduce them to a ground-up mulch. They are also well-adapted where vegetation control is of prime concern rather than turfgrass quality.

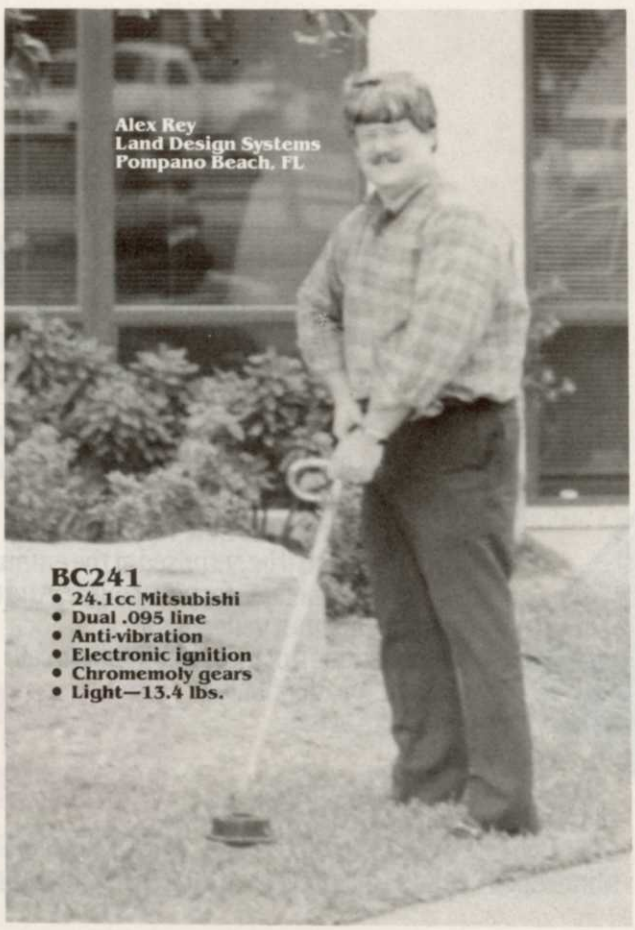
Sickle bar mowers

Sickle bar mowers are for occasionally mowing grass and weeds of hay height. They operate with less power than flails, but they do not mulch what has been cut down.

Sickle bar mowers consist of small arms containing many blades which scissor-cut any grass in their way.

In a landscape context, sickle bar mowers are for roadside banks, slopes, terraces and so on. Their most common use is on coarse, bunch-type grasses. Small units available for lawns are effective, but rather hard to use because of their weight and size compared with other types of mowers.

In landscaping large areas, sickle bar mowers are flexible and manueverable, though slow compared to other types of mowers. The movements of the cutting unit, which is mounted on the side of a tractor, can frequently shake the machine into disrepair. **LM**



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No endorsement by Longwood Gardens is implied.

Visitors to the botanical paradise at Longwood Gardens in Kennett Square, Pa. can sit and admire the gardens' beauty on a variety of teak wood benches. The Chelsea grouping, marked by intricate latticework, is manufactured by Lister Teak. Longwood Gardens consists of 1050 acres, 350 of which are turf and flower beds. A new rose garden will use 20 teak benches. The turf is a 60 percent blend of Fylking, Merit and America Kentucky bluegrass and 40 percent Fiesta and Manhattan ryegrass. A crew of more than 40 people care for the flowers, lawn and trees. The crew mows the turf weekly at 2-2 ½ inches. All areas are irrigated. "One inch of water a week is good practice for turf and annuals," says Carroll Clark, supervising foreman of outdoor horticulture. Clark says the flower beds progress through the season from pansies and tulips in the spring to a variety of annuals in the summer such as petunias, to chrysanthemums in the fall. Turf is fertilized in the spring and fall, usually with a 10-6-4 slow release fertilizer, while flower beds are fertilized according to soil demands. Longwood also uses an extensive I.P.M. program.

Lister Teak benches: Circle No. 200 on Reader Inquiry Card.
Longwood Gardens: Circle No. 201 on Reader Inquiry Card

On Design

BENCH -WARMERS-

by Heide Aungst, managing editor

The Leawood Office Centre in Kansas City, Ks. blends landscaping and hardscaping to fit the corporate, yet natural design. The custom-built redwood benches shown here stretch four feet and 11 feet. Gametime Inc. manufactures the wall-mounted benches in their line of Ultrum site furnishings. Landscape architect Fred Markham and Assoc., Kansas City, Mo. specified the plant materials, while Colonial Nursuries, Blue Springs, Mo. installed the site in August 1986. The turf near the entrance is bluegrass sod. Shrubs consist of Wards yews and blue carpet *(Wiltonii)* junipers. The tree near the entrance is a River birch. Architects Fullerton, Carey and Oman of Kansas City chose the Ultrum furnishings and Devine 50 watt high pressure sodium lights.

Gametime/Ultrum furnishings: Circle No. 202 on Reader Inquiry Card
Fred Markham and Assoc.: Circle No. 203 on Reader Inquiry Card
Colonial Nurseries: Circle No. 204 on Reader Inquiry Card
Fullerton, Carey and Oman: Circle No. 205 on Reader Inquiry Card
Devine lighting: Circle No. 206 on Reader Inquiry Card

The small park area between the Hillcrest professional buildings in Cleveland, Ohio allows patients or employees to take a leisurely break in the day. Park visitors can lunch or just relax on a redwood flat-top or contoured-back (rear of photo) bench manufactured by Kadee Industries. The entire park area is only about 2500 sq. ft. Jeff's Lawn Care Co. of Independence, Ohio renovated the park area in April 1987 after an irrigation pipe burst in the area. The company sodded the area with 200 sq. yards of Merion bluegrass. It is mowed about once a week, depending on growth. The crew uses string trimmers for the turf around the benches' concrete pedastals. The Colorado blue spruce is pruned as needed. The entire renovation, including a new Toro sprinkler system, sod, three benches and a Kadee trash receptacle cost about $3000.

Kadee Industries: Circle No. 207 on Reader Inquiry Card
Jeff's Lawn Care Co.: Circle No. 208 on Reader Inquiry Card

Residents at this private home in Potomac, Md. enjoy summer barbeques on their back porch. The paved patio, constructed of hand-made Cushwa brick, is a mutual design of the home owners and builder Patrick Cullinaine. The design allows for colorful annuals, such as the petunias shown here, to add flair to the red brick. The Country Casual Petite Lutyens bench highlights the patio. The solid teak bench, made in England, is both practical and beautiful in this setting. The seat area stretches six feet, one inch and is slightly contoured. The bench cost less than $1000, while the patio cost about $11 a square foot to install.

Country Casual benches: Circle No. 209 on Reader Inquiry Card.

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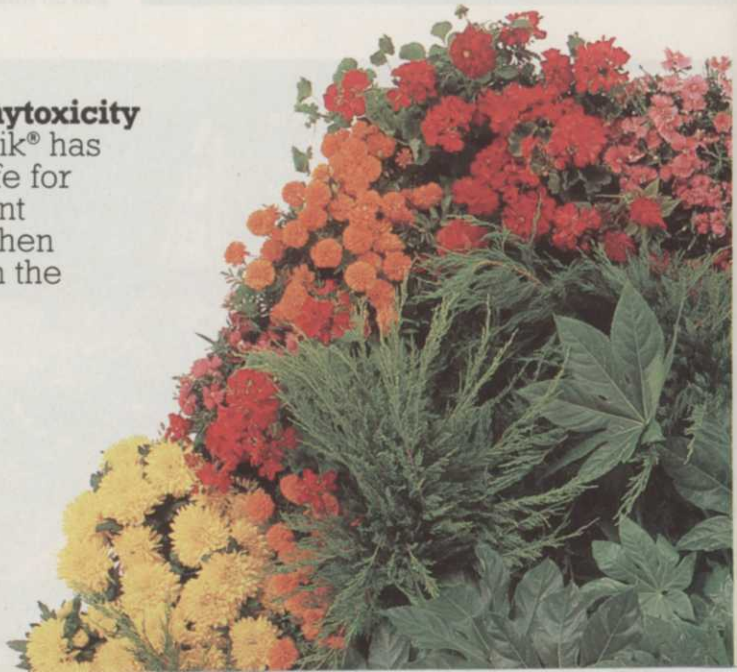

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POST-EMERGENCE WEED CONTROL

For successful post-emergence weed control, the landscape manager must first identify the target weed, then choose the proper material, then apply at the right time.

COOL-SEASON

by Bill Lewis, Ph.D., North Carolina State University

Post-emergence weed control is only one part of a total turf management program. Essential to the control of weeds in cool-season turfgrasses is a healthy competitive grass, one that has been fertilized, mowed and irrigated properly.

The post-emergence herbicides in turf may be classified as foliar-applied selective herbicides. The commonly-used herbicides in this group are the phenoxies (2,4-D, dichlorprop, MCPA and mecoprop), dicamba (Banvel), bromoxynil (Buctril) and the methanearsonates (CMA, MSMA and DSMA). These herbicides are absorbed through the foliage and, with the exception of bromoxynil, readily translocated. There is relatively little, if any, translocation of bromoxynil and bentazon (Basagran) once absorbed through the foliage.

These post-emergence herbicides are quite variable in the weed species they control (Table 1) and in turfgrass tolerance (Table 2).

If weed control is to be successful, weeds must be identified and the proper herbicide selected and applied at the correct time in relation to germination or growth of the target weed, and according to the proper application method. Applying herbicides in 30 to 45 gal. of water per acre (or 1 gal./1000 sq.ft.) should provide sufficient spray coverage.

Broadleaf weeds

Broadleaf weeds are primarily controlled with selective systemic post-emergence herbicides which are absorbed through the leaves and translocated through the plant. 2,4-D has long been the major herbicide for broadleaf control in turf. Today it is widely used in herbicide mixtures. Premixing 2,4-D with mecoprop and/or dicamba broadens the spectrum of weeds controlled.

In many ways, two-and three-way herbicide combinations have become the basic weed control in turf. However, the key to selecting a herbicide or herbicide combination rests on careful identification of the weed species present in the turf.

For example, it may be possible to select a herbicide product containing only one herbicide to provide effective control of the weeds present. If a lawn contained just dandelion and buckhorn plantain, 2,4-D would provide effective control.

By matching the herbicide with the broadleaf weeds present, it may be possible to reduce herbicide costs and lessen the possibilities for turfgrass injury.

Although two-and three-way combinations have been the backbone of weed management programs in turf, certain weed species remain difficult to control; for example, violets and oxalis species. The substitution of dichlorprop in the mixture has improved the control of winter annuals including henbit, chickweed and corn speedwell as well as summer weeds such as spurge, woodsorrel and ground ivy. Control of wild violets may be improved but control is still not consistent.

Herbicide mixtures have been introduced containing triclopyr which is active on many species not controlled by 2,4-D. The triclopyr plus 2,4-D combination has exhibited improved control of ground ivy, yellow woodsorrel, prostrate spurge, wild violet, purslane, corn speedwell and parsley piert. Examples of turf products for broadleaf control are presented in Table 3.

Bromoxynil (Buctril) is a contact herbicide often used for control of annual broadleaf weeds in newly-established turfgrasses since it does not injure seedling grasses. The label says it may be used on seedlings of certain species of Kentucky bluegrass, fine fescue, bentgrass and perennial ryegrass. Also, it may be post-emergence-applied to established bentgrass, Kentucky bluegrass, fescues and ryegrass. Buctril may also be tank-mixed with 2,4-D, mecoprop and dicamba for broadleaf weed control in established cool-season grasses except bentgrass.

Some of the more difficult-to-control weeds may require a repeat application after three to four weeks. It has also been reported that certain difficult-to-control weeds may be more effectively controlled by using ½ the label rate and repeating the applica-

tion in 10 days.

Perennial weeds sometime require a spring application and a fall application for successful control. When planning broadleaf herbicide applications, the normal seasonal fluctuations in turfgrass growth should be considered.

The most appropriate time to apply post-emergence herbicides are during the time when the turf and weeds are actively growing. First, the weeds are more susceptible to the herbicides. Secondly, the turf will more rapidly fill in bare spots which the weeds leave. Cool-season grasses tiller and root development is usually the greatest during the spring and fall.

Also consider the growth cycle of the weed species to be controlled. As the season progresses, the weeds age and become more difficult to control with herbicides. Winter annuals should be controlled early in the spring before flowering occurs. Later in the spring is the preferred time to control summer annual weeds soon after emergence. Perennial weeds are frequently easier to control in the spring as they begin new growth and before any flowering stalks are produced. Fall is another effective time to spray perennial weeds.

Table 1.

Susceptibility of Broadleaf Weeds to Turf Herbicides
Response of Weeds to Herbicides

Weed	Classification of Weed	2, 4-D	Mecoprop (or MCPP)	Dicamba (Banvel)
Bittercress, Hairy	WA	S	I	S
Black Medic	A	R	I	S
Buttercups	WA, B & P	S-I	I	I-R
Carolina Geranium	WA	S	S-I	S
Carpetweed	SA	S	I	S
Catsear	P	S-I	I	S
Chicory	P	S	S	S
Chickweed, Common	WA	R	S-I	S
Chickweed, Mousear	WA, P	I-R	S-I	S
Clover, Hop	WA	I	S	S
Clover, White	P	I	S	S
Dandelion	P	S	S	S
Dichondra	P	S	I	S-I
Dock, Broadleaf & Curly	P	I	I-R	S
Garlic, Wild	P	S-I	R	S-I
Ground Ivy	P	I-R	I	S-I
Hawkweed	P	S-I	R	S-I
Healall	P	S	R	S-I
Henbit	WA	I-R	I	S
Knawel	WA	R	I	S
Knotweed, Prostrate	SA	R	I	S
Lespedeza	SA	I-R	S	S
Mallow	SA	I-R	I	S-I
Mugwort	P	I	I-R	S-I
Parsley-piert	WA	R	S-I	S-I
Pennywort, lawn	P	S-I	S-I	S-I
Plantains	P	S	I-R	R
Purslane, Common	SA	I	R	S
Red Sorrel	P	R	S	S
Speedwell, Corn	WA	I-R	I-R	I-R
Spurge, Prostrate	SA	I	I	S
Spurge, Spotted	SA	I-R	S-I	S-I
Spurweed	WA	I	S-I	S
Strawberry, India Mock	P	R	I	S-I
Violet, Johnnyjumpup	WA	I-R	I-R	S-I
Violet, Wild	P	I-R	I-R	S-I
Woodsorrel, Common Yel.	P	R	R	I
Yarrow	P	I	I-R	S

A = annual; B = biennial; P = perennial; SA = summer annual; WA = winter annual; S = susceptible; I = intermediately susceptible, good control sometimes with high rates, however a repeat treatment 3 to 4 weeks later each at the standard or reduced rate is usually more effective; R = resistant in most cases.

Crabgrass, annual grasses

Methanearsonate herbicides provide an approach to post-emergence crabgrass control in turf. This offers the turf applicator a method of managing a crabgrass-infested turf if a pre-emergence herbicide was not applied in the spring or it fails to perform as expected. The methanearsonates are quite effective if used properly.

The principal methanearsonates are CMA, DSMA and MSMA. These herbicides selectively control large crabgrass, smooth crabgrass, dallisgrass, goosegrass, foxtail and yellow and purple nutsedge. Two- to four-leaf susceptible grassy weeds may be controlled with one application. Once the plant has begun to tiller, a repeat application, seven to 10 days following the first, is required to provide effective control. Two or more applications are necessary for the control of the perennial yellow nutsedge.

These materials have no residual activity so any seedlings which appear after spraying will not be controlled.

Methanearsonates must be applied with extreme care to cool-season turfgrasses because most show sensitivity to these herbicides. Leaf tip discoloration may be evident for one or two mowings. MSMA and DSMA usually cause unacceptable injury to bentgrass. Bentgrass shows more tolerance to CMA. Do not apply the herbicides to any turf growing under stress conditions. It is best to apply herbicides to cool-season grasses early in the summer, thus avoiding applications to these grasses in midsummer.

Another herbicide for post-emergence control of summer annual grassy weeds in selected cool-season turfgrasses is Acclaim (fenoxyprop). Acclaim is used for post-emergence control of smooth crabgrass, large crabgrass, goosegrass, barnyardgrass, foxtail species and panicum species in established perennial ryegrass, fine fescue, tall fescue and annual bluegrass. It may also be applied to Kentucky bluegrass grown east of the Rocky Mountains.

Young actively growing grassy weeds are more easily controlled than the larger grassy weeds. Application

Table 2.

Tolerance of Cool-Season Turfgrasses To Post-emergence Herbicides For Broadleaf and/or Grass Weed Control

Turfgrass	2,4-D	Meco-prop	Di-camba	Brom-omoxy-nil	Di-chlor-prop	Tri-clopyr	DSMA, MSMA, CNA	Bent-azon	Etho-fume-sate	Fenoxaprop
Bentgrass	S-I*	T	I	T	I	S-I	I	T	S	S
Kentucky Bluegrass	T	T	T	T	T	T	I	T	S	T
Tall Fescue	T	T	T	T	T	T	I	T	S	T
Fine Fescue	T	T	T	T	T	I	I	T	S	T
Perennial Ryegrass	T	T	T	T	T	T	T	T	T	T

*I = Intermediately tolerant, use with caution, use at reduced label rates, or minimum label rates; S = sensitive, do not use this herbicide; T = tolerant.

rates are based upon the size of the grassy weeds at the time of application. For example, three-leaf weeds with no more than one tiller can be controlled at minimum label rates. As with any post-emergence applied herbicide, avoid applications to turfgrass under drought stress.

Since Acclaim is absorbed primarily through the foliage, thorough spray coverage is essential for optimum results. It is suggested that 30 to 60 gallons of water per acre be used as the carrier.

Visual injury is usually evident within four to 10 days following application. Visual effects begin with general chlorosis or yellowing of the leaves followed by reddening. Since Acclaim is a systemic herbicide, do not mow treated areas for at least 24 hours following application to allow time for absorption into and translocation within the grassy weeds.

Also, for effectiveness, it is advisable not to mow immediately before application since mowing may reduce the available leaf surface for contact of the herbicide and also grass clippings may interfere with spray coverage of the grassy weeds. Occasionally a second application will be necessary if grassy weeds germinate following the initial application or with extremely dense weed populations or very large grassy weeds.

Acclaim does not have soil residual activity. Do not apply the second application sooner than 14 days after the first. Acclaim should not be applied as a tank mix with 2,4-D, mecoprop or dicamba because this will reduce its effectiveness.

Acclaim essentially has no activity on broadleaf weeds or sedges.

Yellow nutsedge

As previously indicated, the methanearsonate herbicides will control yellow nutsedge. In addition, Basagran may be used on established bluegrass, fescue, bentgrass and ryegrass.

For post-emergence control of yellow nutsedge, initiate application after yellow nutsedge has emerged.

Thorough spray coverage of yellow nutsedge is essential for maximum control. Therefore to do not mow three to five days before or after application.

Annual bluegrass

Prograss (ethofumesate) may be applied for post-emergence control of annual bluegrass and common chickweed in established and new seedings of perennial ryegrass. It is for use by professional applicators in turf sites such as golf courses, parks and lawns.

Prograss is more effective when ap-

Table 3.

Post-emergence herbicides and package combinations for selective control of broadleaf weeds in cool-season turfgrasses.

Common Name of Herbicide	Examples of Commercial Products for Professional Applicators
2,4-D	Various
mecoprop	Lescopex, Mecomec
dicamba	Banvel
bromoxynil	Buctril
2,4-D + dicamba	Lesco Eight-One
2,4-D + dichlorprop (2,4-DP)	Weedone DPC, Weedone DPC Amine
2,4-D + mecoprop (MCPP)	Turk Kleen, Lescopar, 2 Plus 2
triclopyr + 2,4-D	Turflon D, Turflon II amine
2,4-D + dichlorprop + dicamba	Super Trimec
2,4-D + mecoprop + dicamba	Trimec Classic, Trex-San, Lesco Three-Way
2,4-D + mecoprop + dichlorprop	Weedestroy Triamine, Weedestroy Tri-ester
MCPA + mecoprop + dicamba	Trimec Encore, Weedestroy Triamine II

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plied soon after emergence of the weeds. A repeat application may be needed to maintain control 30 to 60 days after the initial application. Prograss is also labeled for control of annual bluegrass in established Kentucky bluegrass on golf courses or other commercially-maintained turf. It is not for use on homeowner lawns. Application rates are slightly lower for Kentucky bluegrass than for perennial ryegrass.

Performance conditions

Environmental conditions, such as temperature, light intensity, rainfall after application, drought stress and relative humidity, can greatly influence the performance of foliar-applied herbicides. These conditions have been mentioned in various places in this article and can be briefly summarized as follows:

- Herbicides are readily absorbed when applied to actively growing weeds.
- Broadleaf herbicides are generally more active if sprayed when daily temperatures are 60 to 80°F. Methanearsonates are more effective from 70 to 85°F. Foliar penetration usually increases within these temperature ranges.
- Soil moisture should be adequate. Under dry conditions, it is advantageous to irrigate prior to herbicide application or wait for a rain. For broadleaf herbicides, there should be a rain-free period of four to six hours following the application. Rainfall or irrigation immediately followimg application is detrimental to the effectiveness of a post-emergence foliar-applied herbicide.
- Generally, high relative humidity increases herbicide action by increasing absorption and translocation.
- Post-emergence herbicides should be applied before mowing to have maximum leaf surface for absorption. When applying methanearsonates or Acclaim do not mow or water for at least 24 hours after application.
- Post-emergence herbicides are less effective if weeds are under stress conditions, and turfgrass tolerance is frequently also lower.

Understanding these and other factors influencing herbicide performance is helpful to explain results obtained and to maximize weed control.

The use of trade names in this article does not imply endorsement of the products named, nor criticism of similar ones not mentioned.

WARM-SEASON

by Tim R. Murphy, University of Georgia

A chemical weed control program in warm-season turfgrasses uses pre-emergence and post-emergence herbicides. Pre-emergence herbicides form the base of the chemical weed control program; post-emergence herbicides are used to control problem weeds that are not controlled by pre-emergents.

Additionally, in the event of a pre-emergence herbicide weed control failure, post-emergence herbicides can be relied on for a complete chemical weed control program provided multiple applications are used throughout the year.

In newly-established turfgrasses, most pre-emergence herbicides are not recommended. Some post-emergence herbicides may be used at low rates. A general rule is to delay the application until after three to four mowings or until the sprigged turfgrasses have rooted and are actively growing. Delaying the application allows the turfgrass sprigs or seedlings to become established and improves their tolerance to post-emergence herbicides.

Selection

Many post-emergence herbicides are available to control weeds in

continued on page 41

Table 1.

Common and trade names of turfgrass post-emergence herbicides.

Common Name	Company	Trade Name and Formulations[1]
asulam	Rhone-Poulenc	Asulox 3.34 lbs./gal.
atrazine	Security	Purge 4 lbs./gal.
	Ciba-Geigy	Aatrex 4L, 90DG, 80W
bentazon	BASF	4 lbs./gal.
bromoxynil	Rhone-Poulenc	Buctril - 2 and 4 lbs./gal.,
		Brominal - 2 and 4 lbs./gal.,
	Lesco	Brominal 2 lbs./gal.
2,4-D	Vertac, Lesco,	Numerous trade names and
	SDS Biotech,	formulations are available.
	Others	
2,4-D + dicamba	Rhone-Poulenc	Weedone SuperDPro Amine
	Lesco	Eight-One Selective Herbicide
	PBI/Gordon	Phenaban 801
2,4-D + dichlorprop	Rhone-Poulenc	Weedone DPC Amine, Weedone DPC
2,4-D + MCPP	Lesco	Lescopar
	Rhone-Poulenc	Turf Kleen
	PBI/Gordon	Phenomec 2+1
2,4-D + MCPP	PBI/Gordon	Trimec Classic
+ dicamba	Mallinckrodt	Trex-san
	Lesco	Three-Way
dicamba	Sandoz	Banvel 4 lbs./gal.
	PBI/Gordon	Dicamba 4
diquat[2]	Chevron	Diquat 2 lbs./gal.
DSMA	Vertac, Vineland	Numerous trade names and
	Others	formulations are available.
ethofumesate	Nor-Am	Prograss 1.5EC
glyphosate	Monsanto	Roundup 4 lbs./gal.
imazaquin	Lesco	Image 1.5 lbs./gal.
MCPP	Rhone-Poulenc	Turf Herbicide MCPP 2 lbs./gal.
	PBI/Gordon	Mecomec 4 4 lbs./gal.
	Lesco	Lescopex 2.5 lbs./gal.
metribuzin	Mobay	Sencor Turf 75W
MSMA	SDS Biotech,	Numerous trade names and
	Platte, Others	formulations are available.
MSMA + 2,4-D +		
MCPP + dicamba	PBI/Gordon	Quadmec
MCPP + 2,4-D + dicamba	PBI/Gordon	Southern Trimec
pronamide	Rhom-Haas	Kerb 50W
sethoxydim	BASF	Poast 1.5 lbs./gal.

[1]Numeral refers to percent or pounds of active ingredient.
[2]Diquat has a state label in Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee and Texas for winter annual weed control in dormant bermudagrass.

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turfgrasses (Table 1), but not one herbicide is appropriate for all turfgrass weed control situations. The following guidelines should be considered to select a post-emergence herbicide.

● **Turfgrass tolerance**—Turfgrass species vary in their tolerance to herbicides (Table 2). For example, Bermudagrass has excellent tolerance to MSMA and DSMA; however, centipedegrass and St. Augustinegrass will be severely injured or killed by these herbicides.

Additionally, cultivars within a species may respond differently to the same herbicide. For example, Meyer zoysiagrass has better tolerance to MSMA than Emerald and Matrella. Always refer to the label to determine if a herbicide may be used on a specific turfgrass species or cultivar.

● **Time of application**—The time of year that a herbicide is applied can influence turfgrass tolerance. For example, dormant Bermudagrass has excellent tolerance to glyphosate; however, severe injury will occur if glyphosate is applied to semi-dormant or to actively-growing Bermudagrass.

● **Weed species**—No single herbicide will control all weed species. Correct weed identification is a prerequisite in selecting an appropriate herbicide. Weed identification manuals and assistance are available at county extension offices. Several chemical companies also distribute turfgrass weed identification manuals.

● **Application frequency**—Similar to turfgrasses, weed species vary in their susceptibility to herbicides. With some weed species and herbicides, a repeat application is necessary to effectively control the weed. For example, two applications of MSMA + metribuzin, at a seven- to 10-day interval, are necessary to control goosegrass. In contrast, small crabgrass can often be controlled with a single application of MSMA. Large, mature crabgrass, however, may require two applications.

● **Ornamental tolerance**—Turfgrass herbicides are commonly applied to sites that contain ornamental plantings. Ornamentals can be injured through contact of the foliage or green bark by herbicide vapor and spray drift and by ornamental root absorption.

Vapor drift is the movement of herbicide vapors from the area of application. Herbicides vary in their volatility or their potential for vapor drift. Ester formulations of the phenoxy herbicides (2,4-D, 2,4-DP) easily volatilize and can injure sensitive ornamentals by vapor drift. Ester formulations should not be used the warm months of the year when conditions are favorable for volatilization. Spray drift damage can be prevented by spraying on calm days when the wind velocity is less than five miles per hour, and selecting a nozzle tip and spray pressure that produces large droplets.

Due to their soil residual characteristics, certain herbicides can injure ornamentals by root uptake. Avoid applications of post-emergence herbicides that contain dicamba or atrazine over the root zone of desirable ornamentals. Injury to ornamentals by root uptake is most likely to

Virginia buttonweed is rapidly becoming the number one problem broadleaf weed in turfgrass.

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86-59

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occur on sandy soils when a heavy rainfall immediately follows a herbicide application.

Precautions

Post-emergence herbicides are applied after annual weeds emerge or when new growth of perennial weeds appears. Follow these guidelines for better weed control and improved turfgrass tolerance.

- Apply post-emergence herbicides in the fall and late spring months. Air temperatures are cooler at this time of year which results in better turfgrass tolerance to herbicides. Also, perennial weeds and many annual weeds are actively growing and are easier to control with post-emergence herbicides. Target the application to coincide with air temperatures between 60 and 90 °F. Applications below 60 °F can result in poor weed control.
- Do not appply post-emergence herbicides to turfgrasses and weeds that are stressed due to high air temperatures or drought. Turfgrass tolerance to post-emergence herbicides decreases at air temperatures greater than 90 °F and when turfgrasses are drought stressed. Herbicides that contain 2,4-D, MCPP, dicamba or MSMA should not be applied at high air temperatures since there is a good possibility of increased turfgrass injury.

Many herbicide labels include warning statements relative to the use of the product at high air temperatures. Always follow the most restrictive warning on the label. Control is also poorer when herbicides are applied to environmentally stressed weeds than when applied to actively growing weeds.

- Do not apply post-emergence herbicides during the green-up process of warm-season turfgrasses. The risk of injury is greater during the spring green-up process (transition from winter dormancy to active growth) than when the turfgrass is fully dormant or actively growing (fully green)
- Repeated applications at low rates will generally improve control and turfgrass tolerance. Single applications at high rates generally cause more turfgrass injury than repeat applications at low rates. Additionally, single applications at high rates often do not control the weed. Refer to the label for information regarding repeat treatments.
- Mowing schedules will need to be coordinated with post-emergence herbicide applications. A general recommendation is to delay mowing three to four days prior to or after a post-emergence herbicide applica-

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Table 2.

Warm-season turfgrass tolerance to post-emergence herbicides.

Herbicide	Turfgrass: Bermudagrass	Centipedegrass	St. Augustinegrass	Zoysiagrass
asulam	T*	NR-S	T	NR-I
atrazine	T (D)	T	T	I
bentazon	T	T	T	T
bromoxynil	T	T	T	T
2,4-D	T	S-I	S-I	T
2,4-D + dicamba	T	S-I	S-I	T
2,4-D + dichlorprop	T	S-I	S-I	T
2,4-D + mecoprop	T	S-I	S-I	T
2,4-D + mecoprop + dicamba	T	S-I	S-I	T
dicamba	T	S-I	S-I	T
diquat	T (D)	NR	NR	NR
DSMA, MSMA	T	S	S	I
glyphosate	T (D)	S	S	S
imazaquin	T	T	T	T
MCPP	T	S-I	S-I	T
metribuzin	T	NR-S	NR-S	NR-S
pronamide	T	NR	NR	NR-T
sethoxydim	NR-S	T	NR-S	NR-I

*Asulam is labelled for use only on 'Tifway' bermudagrass (419).
T = Tolerant at labelled rates; I = Intermediate tolerance, use at reduced label rates; S = Sensitive, do not use this herbicide; NR = Not registered for use on this turfgrass; D = Dormant applications only.

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What goes up must come down... and that goes double for athletes' knees and elbows.

Improved Manhattan II perennial ryegrass has a built-in cushion developed through genetic improvement. The greater tiller density of Manhattan II takes the punishment athletes dish out, then springs back to retain its great-looking appearance. All that toughness... with improved mowability to boot!

Manhattan II also provides a darker green color than the old standard Manhattan; improved disease resistance, drought and shade tolerance as well as fertilizer savings.

Manhattan II was developed to save on maintenance costs ... but the *real* saving is on knees and elbows!

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tion. The delay prior to treatment will increase the leaf surface area of the weed and result in better spray coverage and control. The delay after treatment is necessary to allow adequate time for herbicide absorption and translocation in the target weed species.

- Do not apply post-emergence herbicides immediately before rainfall or irrigation. Generally the performance of most post-emergence herbicides is better when rainfall or irrigation does not occur for six to 24 hours after an application. Rainfall or irrigation immediately after treatment can wash the herbicide from the treated foliage and decrease control.
- Use surfactants and crop oil concentrates according to label directions. The effectiveness of many post-emergence herbicides is enhanced by the addition of a surfactant or crop oil concentrate to the spray mixture. However, indiscriminate use of surfactants or crop oil concentrates can increase the risk of turfgrass injury.

Problem weeds

Nutsedge—Two different species of perennial nutsedge occur in warm-season turfgrasses. Purple and yellow nutsedge can be distinguished on the basis of vegetative differences (Table 3). Bentazon will provide control of yellow but not purple nutsedge. Monthly applications of MSMA in labelled turfgrasses can be used to suppress the growth of both species.

Imazaquin can be used in warm-season turfgrasses for yellow and purple nutsedge control. Recent work conducted in Mississippi and Georgia has shown that imazaquin is better than MSMA for nutsedge control.

Dallisgrass—Dallisgrass is a difficult-to-control perennial grass weed. It is believed that most pre-emergence herbicides will control dallisgrass that arises from seed. Established dallisgrass can be controlled in Bermudagrass and zoysiagrass with repeat applications of MSMA or DSMA. Applications should be made to actively growing dallisgrass. Also, a nonionic surfactant at 0.25% v/v is recommended with MSMA or DSMA for dallisgrass control. It is very important to stay on the treatment schedule (seven to 10 days between applications) for repeat applications. Shortening the application interval to five days may help in areas where dallisgrass has been difficult to control with MSMA or DSMA.

Virginia buttonweed—Virginia buttonweed is rapidly becoming the number one problem broadleaf weed in turfgrass. A perennial, Virginia but-

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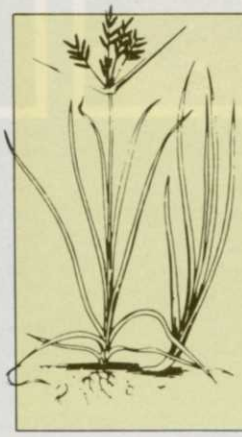
Table 3.

Vegetative characteristics of purple and yellow nutsedge.



Characteristic	Purple Nutsedge	Yellow Nutsedge
Leaf color	dark green	pale or light green
Leaf surface	flat or corrugated	flat or corrugated
Leaf tip	abruptly tapers to sharp tip	gradually tapers to sharp, needle-like tip
Rhizomes	wiry, scaly	weak, threadlike
Tubers	oblong, coarsely hairy	spherical, smooth
Tuber taste	bitter	sweet
Seed head color	reddish - to purplish-brown	yellow

HINTS FOR HERBICIDE APPLICATION

1. Read and observe instructions and precautions on the herbicide label.
2. Calibrate sprayers and recheck calibration prior to herbicide application.
3. Apply the proper rate of herbicide. Too much herbicide may damage or kill turfgrass.
4. Apply herbicides in one pint of water per 100 square feet or one gallon of water per 1,000 square feet.

tonweed reproduces by seed, cut plant pieces and fleshy roots. Research conducted in Mississippi has shown that 2,4-D + dichlorprop has provided better Virginia buttonweed control than other two-way or three-way broadleaf herbicide mixtures.

Additionally, applications of oxadiazon or simazine at the time of 2,4-D + dichlorprop application will increase the control of Virginia buttonweed. The increase in control with oxadiazon or simazine is believed to be the control of Virginia buttonweed plants that arise from seed.

Bahiagrass—Repeat applications of MSMA or DSMA will control bahiagrass in tolerant turfgrasses. In centipedegrass, repeat applications of sethoxydim will suppress bahiagrass growth and seedhead development.

Prostrate spurge—Repeat applications of two-way or three-way broadleaf herbicides will be required to control this summer annual broadleaf weed. In Bermudagrass, low rates of metribuzin (0.125 to 0.25 lb. AI/acre) will effectively control prostrate spurge.

Wild garlic—Wild garlic is a perennial that appears in turfgrasses in the mid- to late-fall months. Fall (November)/winter (January-February) applications of 2,4-D or two-way and three-way broadleaf herbicides that contain 2,4-D or dicamba will control wild garlic.

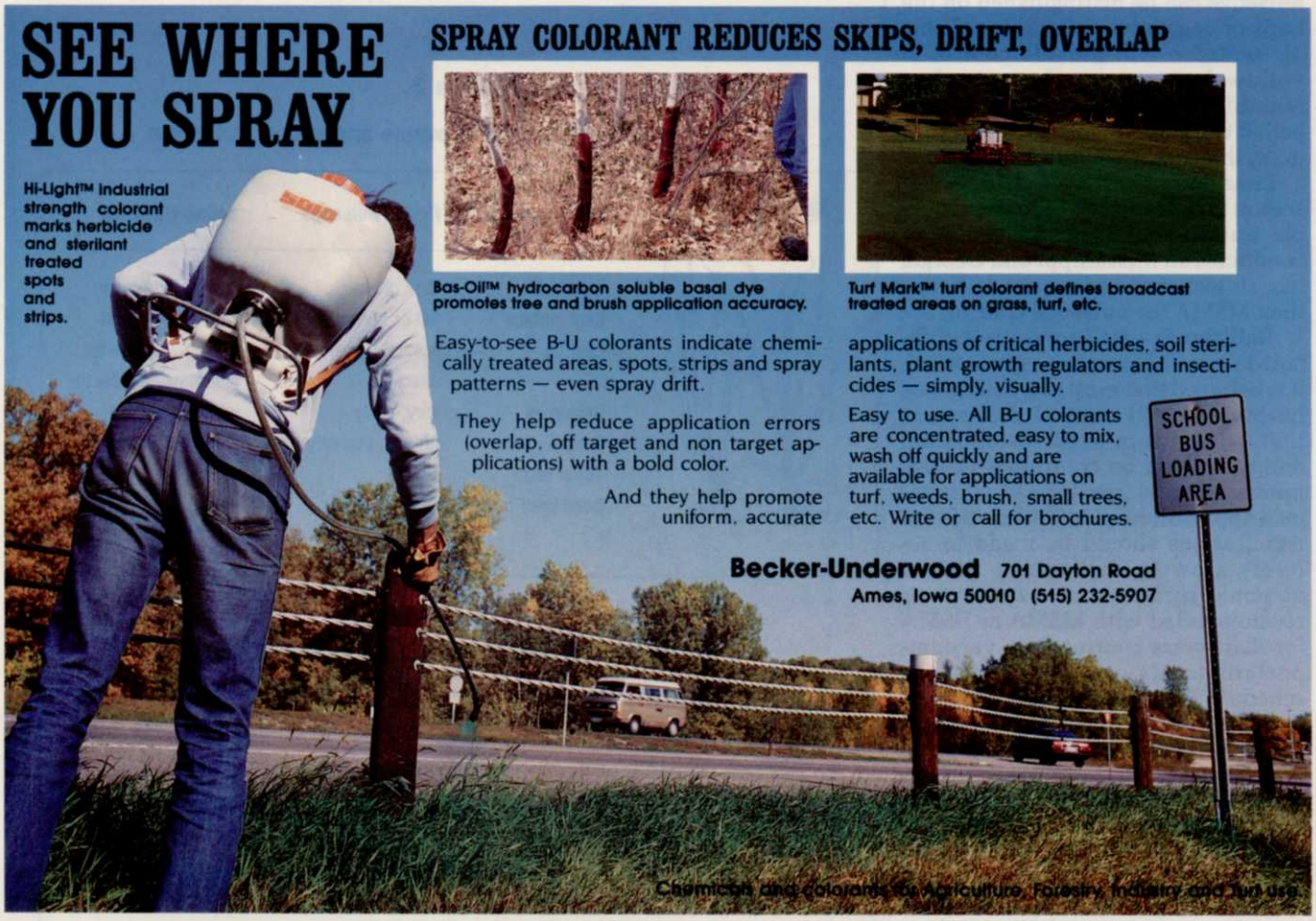
Controlling prostrate spurge requires repeat applications of two- or three-way herbicides.

To effectively eliminate this weed from the turfgrass, the fall and spring treatment program will need to be repeated for two to three consecutive years.

Imazaquin has provided excellent control of wild garlic in experiments conducted in Mississippi. Late fall applications to emerged wild garlic have provided slightly better control than early spring applications.

Post-emergence herbicides enable the turfgrass manager to control many problem weeds not controlled by pre-emergents. In the event of a pre-emergence weed control failure, post-emergence herbicides can be relied upon for a complete chemical weed control program. However, sole reliance upon post-emergence herbicides for a total weed control program is risky.

Cultural practices that favor good turfgrass growth and development, the use of pre-emergence herbicides and the timely use of post-emergence herbicides will help the turfgrass manager to achieve the goal of a high quality, weed-free turfgrass. **LM**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"You can't cut grass with headaches. That's why I switched to Bunton."

Bill Wright, President
Lawn-Wright, Inc., Gaithersburg, Maryland

"When I started my lawn service business seven years ago I had a push mower and riding tractor. It only took a year to realize I could cut a lot more grass in the same amount of time with one commercial walk-behind mower," says Bill Wright, president of Lawn-Wright, Inc. "Four years later I discovered Bunton. Now I can cut even more grass with the same number of mowers."

The reduction in maintenance headaches compared to his other mowers was so significant that two years ago Bill Wright replaced his eleven mower fleet with Buntons. Here's why he just bought seven more:

Welded steel deck construction

"With Bunton, the deck is reinforced and welded into a single piece, not bolted together like other mowers. With no bolts to fall out, the problem of sagging decks and misaligned belts and blades was eliminated. Our maintenance went down and quality of cut went up."

Stronger parts/better engineering

"Other manufacturers make caster supports, bell cranks and other parts from aluminum, which breaks easily. Bunton makes them from steel, so they're more durable. And, Bunton has fittings at all critical wear points so parts can be greased to make them last longer."

Better belt system

"Because the belts are wrapped in straight lines without twists or back-bends, our belt life increased by at least five times when we switched to Bunton."

Variable speed drive system

"Bunton's pulleys are larger so we get better belt contact and less slippage, even when they're wet and going up hills. We also get a larger range of speeds with Bunton than with other mowers."

Savings of time and money

"There are many other features on Buntons that lower my maintenance costs. Overall, I have saved at least $6,000 in the two years since switching to Bunton, not including the added profit from increased productivity."

If you need more cutting capacity and fewer headaches, discover the profit in converting your fleet to Buntons. Call for the name of our local dealer.

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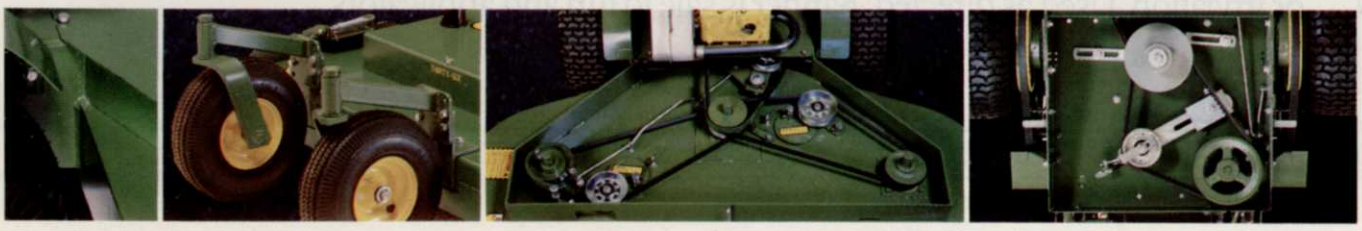

Circle No. 105 on Reader Inquiry Card

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THE BANNER PREVENTIVE PROGRAM

How to prevent dollar spot

Apply Banner at a 1 oz. rate early (April-May through September) to prevent dollar spot from ruining your greens for full 28-day control.

How to prevent brown patch and other diseases

Apply Banner at the 2-4* oz. rate (May or June through September) for 10-21 day brown patch control. And at 1-2 ozs., Banner provides excellent systemic control of anthracnose, powdery mildew, rust, red thread and stripe smut. Or, use Banner at the higher 2-4* oz. rate to achieve broader-spectrum control of leaf spot and melting out for 14-21 days. And the 4* oz. rate for summer patch and spring dead spot at 30-day intervals.

Tank mix Banner to control already-present brown patch

As with all turf fungicides, Banner's scheduling is critical. But when schedules are interrupted and brown patch is present, use Banner at a 2 oz. rate in a tank mix with contact fungicides like Daconil 2787® or Chipco® 26019. The contact fungicides will control existing diseases and Banner will prevent future infections.

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Circle No. 106 on Reader Inquiry Card

A GOOD LINE

It might not get you a date, but a line trimmer will ease back pain by eliminating the need for stressful kneeling and bending to cut weeds or trim grass.

by Jeff Sobul, assistant editor

Oft times, brilliant ideas are born by accident. The line trimmer is no exception. Back about 17 years ago, George Ballas, a Texas real estate broker, got tired of the hairy weeds growing around the roots of two large oak trees in his yard.

So he went fishing for ideas and one popped into his head. He pulled an empty popcorn can out of the trash and poked holes for some nylon fishing line, then attached it to his long-handled power edger.

It was loud, he noted some years ago, but it did what he wanted it to do: rip grass and weeds from the oak's roots.

He called it the Weed Eater and set about marketing it. In 1972, his sales were a bit more than $500,000. Over the next four years, they grew exponentially, to $41 million in 1976. An industry was born.

Spreading like weeds

About two dozen companies in the United States manufacture, assemble and market string trimmers these days for both home and commercial use. LANDSCAPE MANAGEMENT readers spent an estimated $6 million on line trimmers in 1987. (This sales figure does not include the home market.)

Not surprisingly, trimmers have evolved and advanced immensely since their creation. Units are powered by electric cord and batteries in addition to gas-powered models.

Features that improve ease and efficiency of operation include automatic line feeders. The machines are safe, with line that tends not to cut skin, and debris guards to protect operators from flying detritus.

Why so popular?

Weed Eater was the first prototype nylon-line grass trimmer. The invention created a new product category that developed rapidly. More than 20 million Weed Eater gas and electric-powered lawn trimmers have been sold to professionals and homeowners, according to the company. (Fred Pascarelli of Homelite notes there is no real distinction in product between homeowner and professional.)

One of three trimmers from Bunton.

In all, says Weed Eater brand manager Chuck Mattes, since the market began in 1972, total market sales have exceeded $2 billion. Units sold have gone from zero to nearly equaling that of lawn mower sales per year.

"We had no idea how big the market would be," Mattes notes. The machines' original intentions were for people physically unable to get down on hands and knees or bend over to use hand clippers to trim or edge.

But with prices for electric trimmers starting at around $20, trimmers became common sights everywhere. "If anyone's ever used a chain saw, they can use a trimmer," Mattes states.

Sales of gas-powered trimmers rose dramatically after prices were reduced, beginning around 1981 and taking off in 1983-84. Sales continue to rise between 10 and 20 percent annually. Mattes estimates that homeowners account for 80 percent of the market, but that is "a function of price." Pricier versions go to the professionals. "People who have to use them every day look at the features rather than the price," he explains.

Municipalities benefit greatly from the machines. "The trimmer adds a versatility they never used to have," Mattes says, saving time and labor costs in the process.

Market growth shows no sign of slowing much either. Companies such as Solo continue to enter the market. In Solo's case it was to complement an already existing line of lawn grooming products, according to Solo's Jim Dunne. New technology such as the automatic feed heads featured on many new models will continue to add fresh ideas into the market. And, as Mattes notes, "there's alway's something new on the horizon."

The following is just an introduction to some established product lines and what has recently been introduced into the market by a number of companies:

Brushking—Brushking recently introduced the BK35 string trimmer with a 35 cc engine weighing in at 12½ pounds. It has a padded shoulder strap and handles four different Brushking monofilament line heads.

Bunton—Bunton has three trimmer sizes available with a choice of a tap string feed or manual string feed on each model. The smallest unit features an 18 cc Kawasaki 2-cycle engine and flexible type drive shaft.

The larger commercial units feature solid drive shafts with heavy-duty reduction gear drives for long life. These models are available with electronic ignition and a 24 cc or 33 cc Kawasaki two-cycle engine. All models include shoulder strap, engine stand, on-off switch, tool kit and blade guard.

John Deere—The 110G, 210G, 240G and 260G are four new gas-powered nylon line trimmers and bushcutters developed by John Deere. All four trimmers are powered by a redesigned engine with a 21.2 cc displacement. This is an air-cooled, two-cycle single-cylinder power plant. A new carburetor for the 110G, 210G and 240G simplifies adjustments. Only the idle speed requires setting.

Models 110G and 210G cut a 16-inch path with a single-exit nylon cutter head and 0.080-inch-diameter nylon line. Shaft length is 48 inches. Models 240G and 260G cut a 17-inch path with a dual-exit nylon cutter head and

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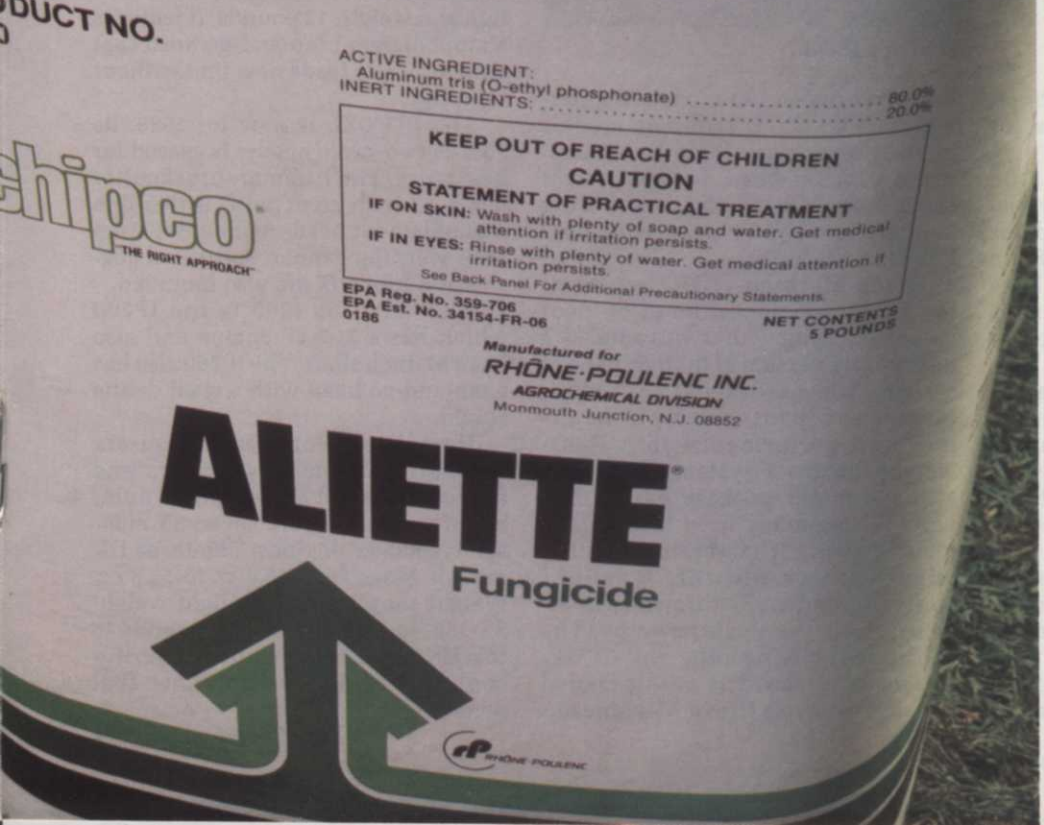
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In addition, CHIPCO ALIETTE fungicide offers you 21 days of Pythium protection from a single application. Even in hot, humid weather, CHIPCO ALIETTE fungicide stops Pythium *before* it gets started.

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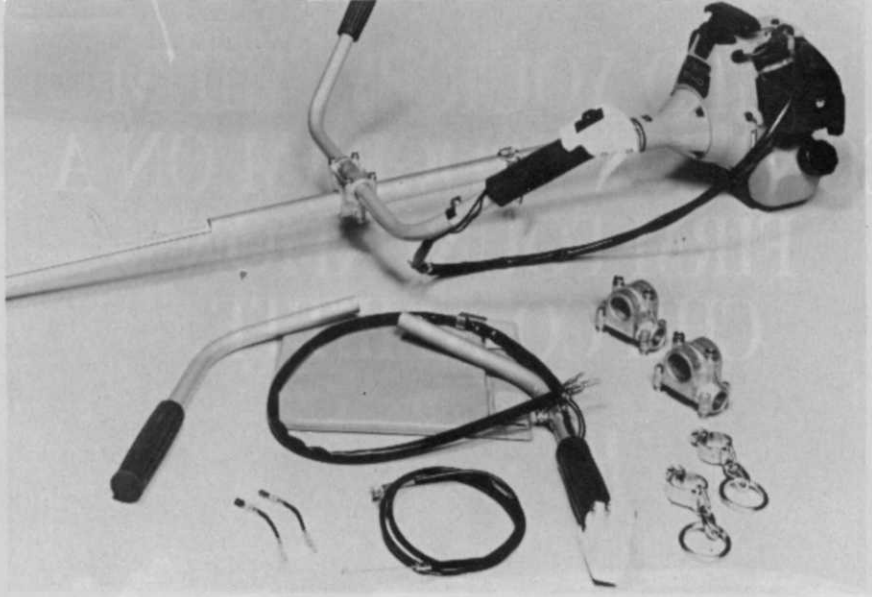
Deere's new 110G.



Echo's U-Handle kit.

Green Machine's new Expand-It System 3510.

Hoffco's JP260.

0.095-inch-diameter nylon line. Shaft length for the 240G is 55 inches; for the 260G, it's 59 inches.

Echo—Echo Inc has added a .105 line to its assortment of gas-powered string trimmers recommended for manual two-line heads only. Echo also offers .65, .80, .95, and .130 lines for its trimmers. The new .105 line is designed for moderately heavy cutting.

Echo has added an additional U-handle kit to its line of trimmer accessories. The handle kit now makes it possible for any 1986 straight shaft SRM trimmer/brushcutter to be fitted with a U-handle. The U-handle fits all 1987 straight shaft SRM models plus the SRM-250E. The existing U-handle kit fits models SRM-200DA through SRM-300AE and SRM-200 through SRM-200CE.

The Echomatic trimmer head is now standard on all Echo string trimmer and brushcutter models. Lighter-weight Flexishaft trimmer models have the regular single-line Echomatic trimmer head. Larger straight shaft models have the heavy-duty Echomatic trimmer head with dual line feed.

Green Machine—HMC, maker of the Green Machine line of outdoor power equipment has introduced a heavy-duty version of their Expand-It system. The new Model 3510 offers landscape professionals high-powered performance in a lightweight, compact system. The basic string trimmer package easily converts to commonly used landscaping tools: a string trimmer/brushcutter, edger, power blower, weeder/cultivator and snow-thrower. All attach quickly to a single powerhead by adjusting two wing nuts.

The powerhead is an air-cooled 24.1 cc, two-cycle Green Machine engine. Maximum horsepower is 1.2. The powerhead weighs 10 pounds.

The Panther Model 2840 String Trimmer/Brush Cutter was the first Expand-It System set of tools designed for landscapers and lawn service professionals. These are also interchangeable, easily attached to the single 24.1 cc, 1.3 hp power source using a single knob on the tool shaft.

The Panther series two-cycle gasoline engine (Model 2810) features solid state ignition, a recoil starter and a quiet-tone muffler with guard. The Model 2840 string trimmer/brush cutter combines the blower unit with a tool for those uses. The unit includes a 47.8-inch shaft and a standard debris and blade guard for safety.

Hoffco—Hoffco offers a number of trimmers for the commercial market. The Critter is a new trimmer with a 21.2 cc engine. It has solid state ignition and weighs 12 pounds. It features a monofilament tap-and-go head that automatically feeds new line without stopping.

The JP390XL is new for 1988. Its 30.5 cc two-cycle engine is geared for heavy use. The trimmer/brushcutter has a 57-inch shaft with a two-line monofilament head. A shoulder strap with warning banner, soft-sided goggles and fuel mix are also included.

Also new for 1988 is the JP260 which has a 21.2 cc engine and also has a 57-inch shaft. The JP260 also has a tap-and-go head with a steel debris shield.

Homelite—Homelite offers six straight shaft model trimmers and four curved shaft models plus a number of accessories. All seven ST models have 25 cc engines. The three HK models range from 18.4 cc to 33.3 cc. Weight ranges from the light weight ST-155 and ST-175 at 9¾ pounds to the HK-33 at 18¾ pounds. Translucent fuel tanks clearly show fuel level.

continued on page 54

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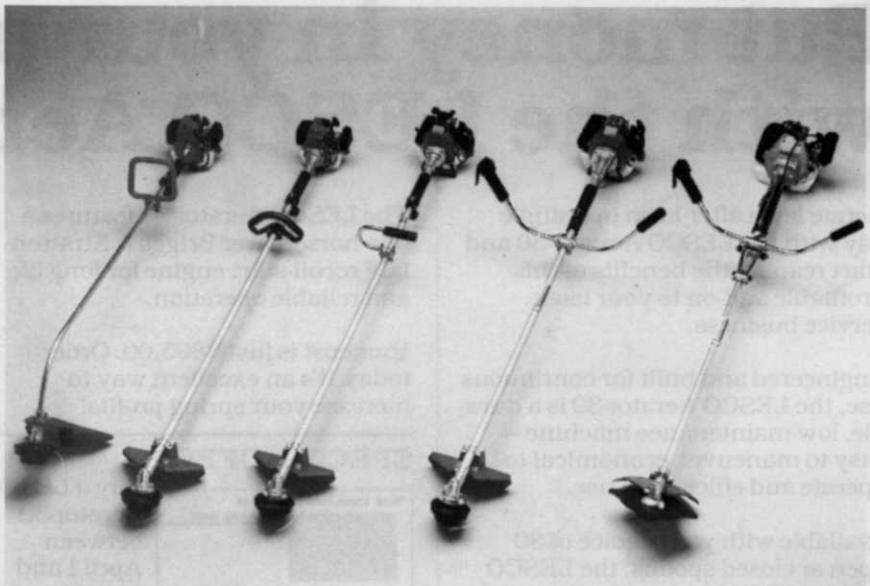
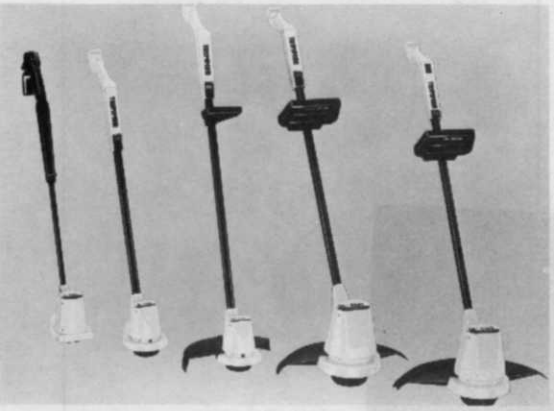


Maruyama's complete trimmer line.



Paramount's five new electric trimmers.

The Shindaiwa Bump 'n' Cut trimmer head.

Poulan's Weed Eater XR 125 trimmer/brushcutter.

The company also offers five electric power trimmers. All have automatic line feed and fully adjustable hand grips. Cutting swaths range from 10 to 16 inches.

Jacobsen—Jacobsen offers two models, the J-24 and J-33 string trimmers. The J-24 features a 24.1 cc engine, the J-33 a 33.3 cc engine. A shaft-mounted throttle trigger allows greater control of engine speed on both models. A tool kit is included with both models.

Lesco—Lesco offers two new string trimmers for the commercial market. Both feature two-cycle Fuji engines, the 30.5 cc 009500 and the 15.4 cc 009100. The 009500 has a 57-inch straight shaft with a two-line head and 15-foot spool. It weighs 14 pounds. The 009100 has a 48-inch curved shaft with a monofilament head with automatic feed and a 40-foot spool. It weighs 11.5 pounds. Lesco also offers universal replacement trimmer heads and line.

Maruyama—Maruyama offers a full line of string brushcutter/trimmers ranging from 18.4 cc to 40.2 cc featuring Kawasaki engines and Maruyama-manufactured Mitsubishi engines. The brushcutters have been tested by the Japanese government to be the lowest in the market in vibration and noise, according to the company.

All Maruyama brushcutters feature electronic ignitions and diaphragm carburetors. All straight-shaft models have five rubber-encased brass bushings which eliminate shaft flex and vibration.

Paramount—Paramount recently introduced five new electric trimmers to its existing line. The trimmers range in cutting width from seven inches to 16 inches. Two other new models feature the motor in the handle for easier control.

Weed Eater—Poulan/Weed Eater has an extensive line of lawn and garden trimmers. The electric trimmer product line includes: Weed Eater 1208, 1210, 1212, 1214 and 1216. Gasoline-powered trimmers include: XR 20T, XR 50A, XR 80A, the new XR 125 trimmer/brushcutter, XR 200 trimmer/brushcutter, 1400T, 1600T, 1700A and the 1720A trimmer with blade kit.

Yard Pro trimmers carry a variety of upgraded amenities. New gasoline models, the 115 and 145, have been added for 1987-88, as has a new electric model, the Yard Pro 16. Existing gasoline-powered models include: the Yard Pro 120A, 130A 160 and the 200.

The company also offers replacement parts ranging from nylon line to blade kits and fuel caps.

Shindaiwa—Shindaiwa's T-20 trimmer features a 21.1 cc two-cycle engine and generates 1.1 hp, while weighing less than 10 pounds.

Shindaiwa also introduced two new nylon heads for its grass trimmers. The Japanese manufacturer also offers a complete range of professional trimmers and brushcutters.

The Bump-and-Cut head offers semi-automatic line indexing. Replacement line is easy to install. The compact Midget head features a quick-feed manual design for line indexing, which allows the user to advance line without loosening the arbor bolt.

continued on page 56

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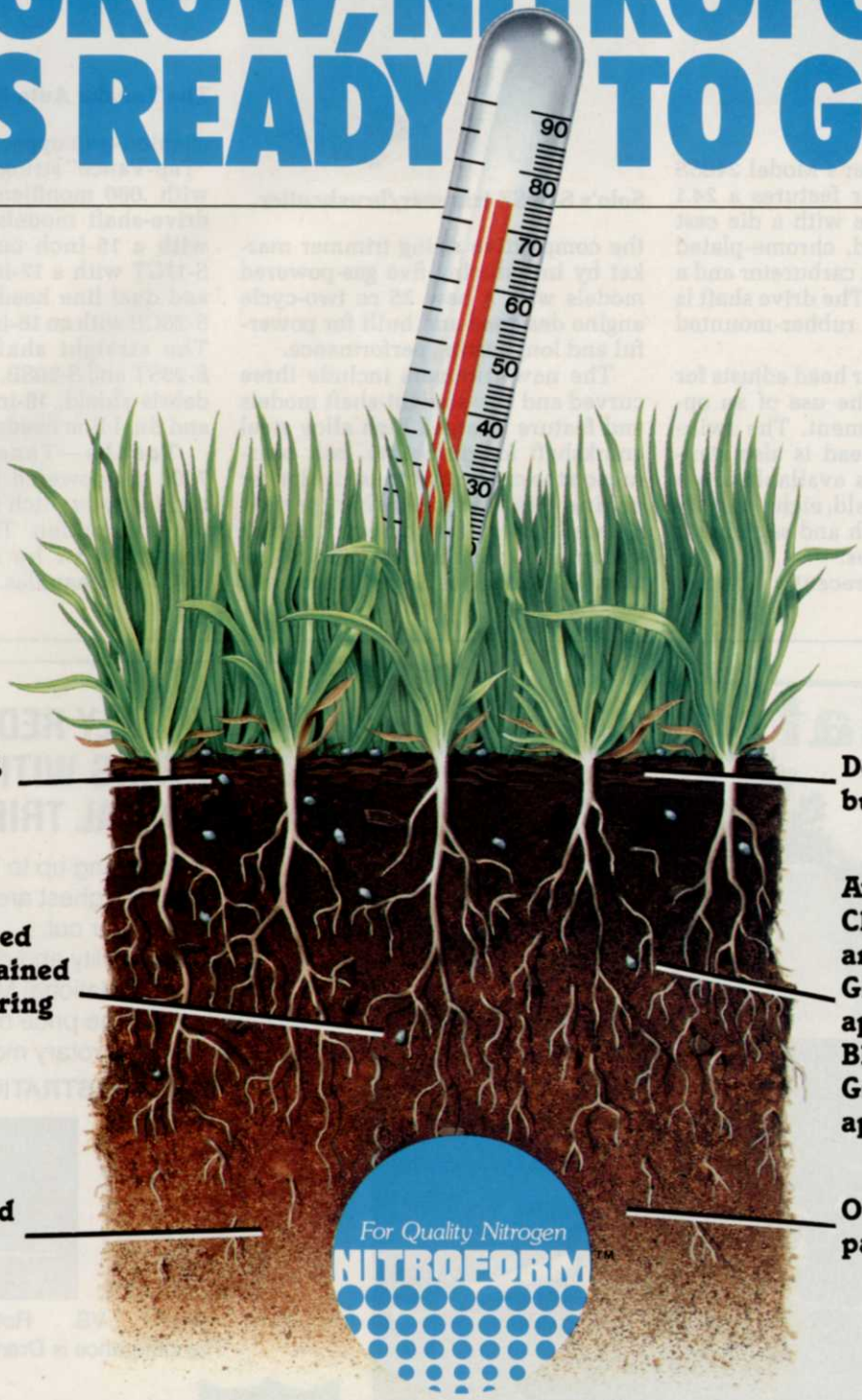

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TRIMMERS *from page 54*

The Snapper 210SS.

Snapper—Snapper's Model 240SS commercial trimmer features a 24.1 cc, two-cycle engine with a die cast steel connecting rod, chrome-plated cylinder, diaphragm carburetor and a 20-ounce fuel tank. The drive shaft is solid steel with five rubber-mounted bushings.

The rotatable gear head adjusts for slopes and allows the use of an optional edger attachment. The twin-line manual feed head is also standard. Other options available are a heavy duty steel shield, eight- and 80-tooth blades, a brush and sapling kit and bullhorn handles.

Solo's S-30SB trimmer/brushcutter.

Solo—Solo Inc. recently entered the competitive string trimmer market by introducing five gas-powered models with a new 25 cc two-cycle engine designed and built for powerful and long-lasting performance.

The new trimmers include three curved and two straight-shaft models and feature a forged high alloy steel crankshaft for durability, ball bearings on the crankshaft to assure longer engine life and smoother performance, a special carburetor priming system and solid state electronic ignition. Each unit has fingertip controls, cushion-grip upper handle and a new "Tap-Vance" string advancing system with .080 monfilament line. Curved drive-shaft models are the: S-15CT with a 15-inch cutting swath, the S-17CT with a 17-inch cutting swath and dual line head, and the heavier S-25CB with an 18-inch cutting swath. The straight shaft units are the: S-20ST and S-30SB, both with a metal debris shield, 18-inch cutting swath and dual line heads.

The Tanaka Auto-Start 7000.

Tanaka—Tanaka's Auto-Start 7000 gas-powered trimmer starts by turning the switch to on and pressing the start button. The 13-pound unit generates 1.1 hp and has rubber-cushioned handles. **LM**

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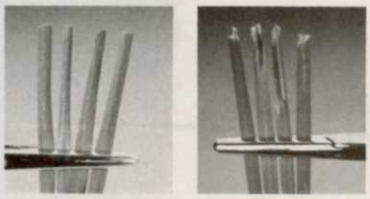

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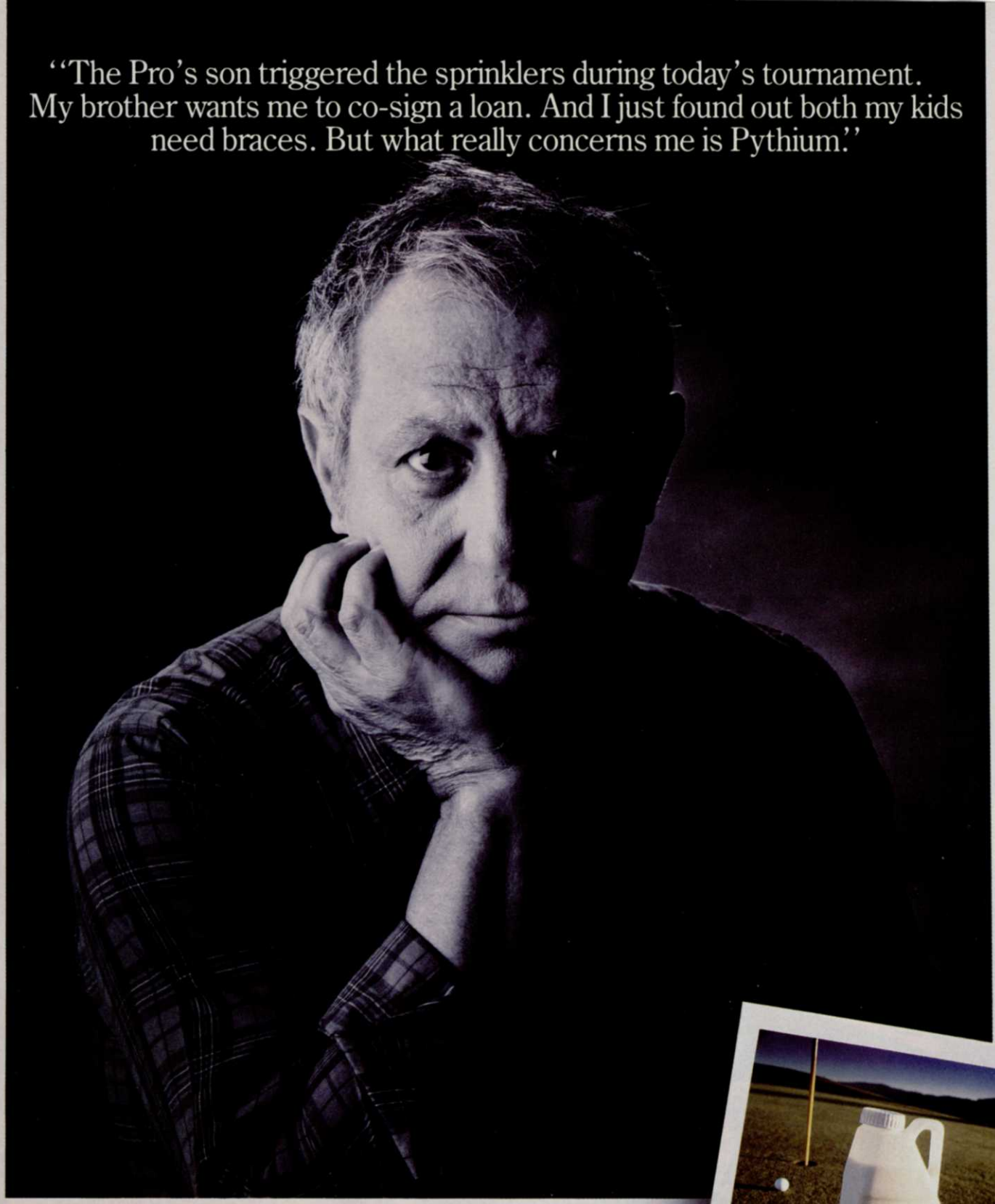
"The Pro's son triggered the sprinklers during today's tournament. My brother wants me to co-sign a loan. And I just found out both my kids need braces. But what really concerns me is Pythium."



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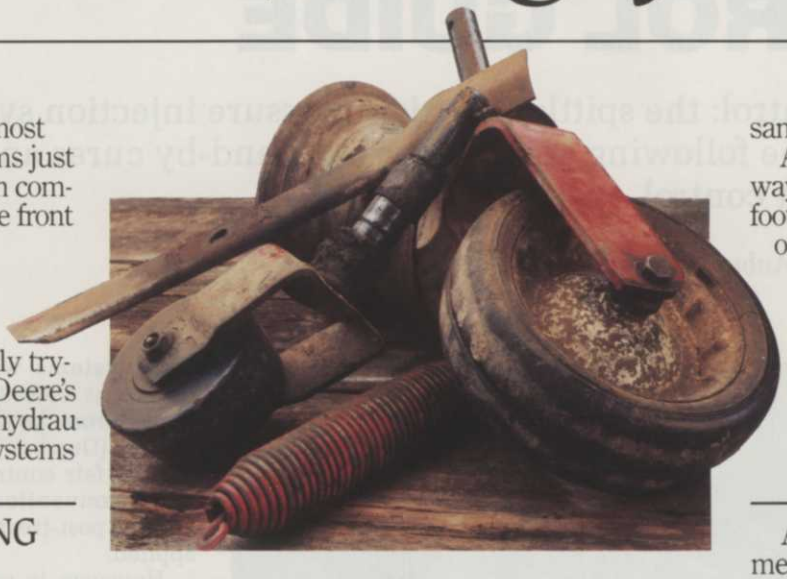
JOHN DEERE

Trying to keep up with our traction advantages is wearing the other guys out

Others try. But most traction-assist systems just don't cut it. Not when compared to a John Deere front mower.

In fact, components on other mowers actually wear out faster simply trying to do what John Deere's differential lock and hydraulic weight transfer systems do so easily.



Trying to match the traction advantages of John Deere front mowers is hard on other machines.

NO BOUNCING DECK

Springs are the key components in many weight transfer systems.

But, if you've ever seen a kid on a rocking horse you know what springs do. They bounce.

One knob hydraulically transfers weight from the mower deck to the drive wheels on John Deere's F930, F932, and F935.

That's also what happens when you put springs on a mower deck. A side effect that's damaging to both deck components and quality of cut. John Deere's weight transfer system is better. Here, your mower deck doesn't bounce because there are no springs. Weight is hydraulically transferred to the drive wheels by simply turning a knob on the right console.

You get better traction without sacrificing mowing quality. Best of all, it's all done on the move so you're always in control of changing conditions.

NO WORN-OUT BRAKES

A standard differential lock is the second major part of the system. Here, a touch of a pedal is all it takes to lock both drive wheels on the move. So, if one wheel slips, the other can still pull you through.

It's not a brake. There are no drums to heat up or wear out. It's a straight linkage in the axle that allows both wheels to turn at the same speed.

A much more positive way to get through tough footing than what the others would have you do—ride your traction assist brake.

Why not save that for when you really need it?

NO LOST MOMENTUM

All told, you get a tremendous traction advantage with John Deere. The ability to use the differential lock and hydraulic weight transfer on the move means you work better on steep slopes, sidehills, and slick ground without losing valuable momentum.

A touch of a pedal locks both drive wheels on John Deere front mowers to help get you through difficult conditions.

Talk to your John Deere dealer today for more information on these superior machines.

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Circle No. 111 on Reader Inquiry Card

WARM-SEASON INSECT CONTROL GUIDE

New in insect control: the spittlebug, high-pressure injection systems and biotechnology. The following guide offers old stand-by cures and new advances in insect control.

by Patricia Cobb, Ph.D., Auburn University

The flight of the adult green June beetle usually peaks in late May or June.

Insect damage continues to limit production and maintenance of quality turf in many areas of the southern United States.

Insect pests offer southern turf managers a variety of challenges. Soil insects such as mole crickets, fire ants and some grub species expand their range each year. Estimated costs to control mole crickets on some Georgia golf course turf are up to $1,000 a hole during the 1986-87 season.

Fire ant control cost estimates in Alabama (including turf and other areas) exceeded $5 million last year. The last two summers' droughts in many areas, excess rainfall in others, coupled with high temperatures, complicated control efforts.

Cultural measures and insecticidal treatments can be timed to maximize the control of pest populations. Availability of alternative insecticide controls remains low, but new technology and research offers hope for more effectively using insecticides. Research continues for insect-resistant turf varieties and effective biological control agents.

New technology

High-pressure injection systems are not new. Injecting insecticides into turf at 300-650 psi has resulted in limited success and even failure in areas of the South where soils are rich in organic matter or contain a high percentage of clay.

Cross Equipment Company of Albany, Ga. has developed high-pressure systems which inject insecticides at 1500-2000 psi as nozzles move across the top of the turf. Chlorpyrifos (Dursban) and diazinon give poor to fair control of mole crickets when conventional treatments (including post-treatment irrigation) are applied.

However, in recent tests with the new high-pressure injection, both insecticides have given excellent residual control of mole cricket damage. Another advantage of this system is reduced surface residue of insecticides. Preliminary tests for billbug and white grub control with this system also look promising.

Other new tools

Derived from a soil bacterium, abamectin is a new and different type of insecticide. Merck registered this product in 1987 as Affirm Fire Ant Bait. Affirm destroys fire ant colonies by disrupting reproductive potential. However, Affirm works slowly and worker ants may be present in established colonies for six weeks or more.

Derived from a soil bacterium, abamectin is a new and different type of insecticide.

Triumph 4EC (Ciba-Geigy) registered for restricted use by lawn care professionals, gives lawn managers an excellent new tool for grub control in many areas of the South. However, current labeling prohibits application

1987 TIMING STUDY WITH MOCAP 10G AND TURCAM 2.5G FOR MOLE CRICKET DAMAGE CONTROL* (ALABAMA)

Name, No. Treatments	Rate/Treatment lb AI/acre	Arrow length indicates damage control effectiveness JUNE**	JULY	AUGUST	SEPT.
Mocap, 2	5	→	→	→	
Turcam, 2	2	- - - →	→	→	
Mocap, 2	5		→	→	→
Turcam, 2	2		→	→	
Mocap, 1	10		. . . →		
Mocap, 2	5			→	→
Turcam, 2	2			→	
Mocap, 1	10			. . . →	

*Damage evaluated weekly (Rating system 0-9; Cobb and Mack, 1988)
**Newly hatched nymphs observed June 2.

on "sandy" soils, so use is limited in many areas where mole crickets are a major problem.

Two strains of parasitic nematodes, furnished by Biosis of Palo Alto, Calif., show promise in controlling or suppressing mole crickets.

Field tests in Alabama the past two years and in South Carolina last year resulted in "cautiously optimistic" damage control on frequently-irrigated turf. The nematodes tested have been exempt from registration by EPA. Further testing will try to identify optimum establishment requirements, refine application techniques and discover proper timing.

Cool-season turf-type fescue and ryegrass varieties are being grown farther south. Most of these are endophyte-infected grasses, and show some resistance to damage by surface feeding insects.

Timing

Timing of insecticidal control continues to be a key factor in determining the extent to which controls work. Timing studies this past year indicated that Mocap or Turcam granules applied to smaller, newly-hatched mole cricket nymphs in June and July worked more effectively to control damage than August applications when larger nymphs were present.

Even treatments of half rates of Mocap applied in June and July gave longer acceptable damage control than full rate treatment in August.

Guidelines

To determine correct timing, life cycles of important pests must be understood. The following information suggests seasonal control strategies for common Southern turf insect pests, including some suggested insecticidal controls.

However, every turf manager's situation has characteristics all its own. Turf professionals should know their situations better than anybody else. (There is no substitute for frequent turf inspection!) **LM**

The comments herein should be used as guidelines fir development of control strategies for Southern turf pests. No endorsement of specific products is intended.

The spittlebug nymphs infest areas of turf with thatch accumulation and high humidity.

High pressure injection can give excellent residual control of mole crickets.

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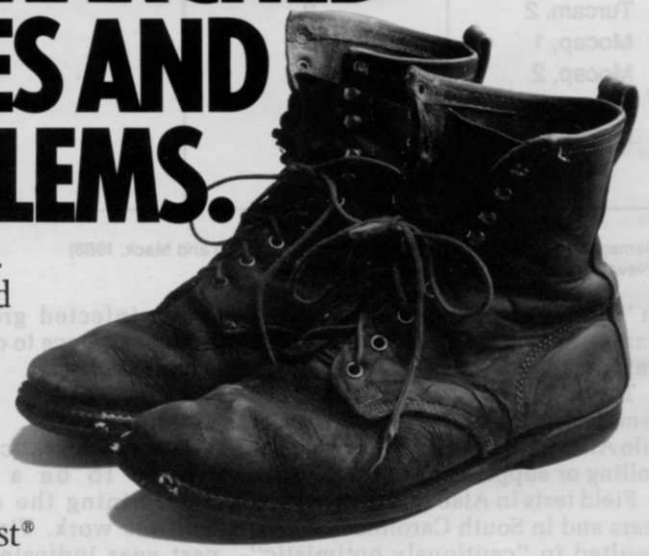

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Medalist North Mix	Fairways, tees, cart paths, wear areas.	Quality turf for high traffic areas. Clean mowing and disease resistant.
Premium Sod Blend	Commercial sod production.	Exceptional dark green color. Tolerates light shade. Superior disease resistance. Rapid sod producer.
Renovator Pro Mix	Problem solver for heavy traffic areas (athletic fields, golf tees, and fairways).	Penetrates compacted soils and combats *Poa annua.* Adaptable to most geographic regions.
Medalist Brand Overseeding Products	Winter overseeding of dormant bermudagrass.	Establishes rapidly and evenly. Tolerates traffic while providing a superior putting surface. Smooth spring transition.

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CONTROL CALENDAR

Late Winter (March)

Chinch bugs and billbugs—In southern Florida, the southern chinch bug is active throughout the year. In other southern areas, chinch bugs and billbugs become active during warm days in late winter. Most varieties of St. Augustinegrass and occasionally Bermudagrass are more likely to be infested by chinch bugs.

Zoysia and Bermudagrasses may be attacked by the hunting billbug. Billbug adults and overwintered chinch bug adults become active during sunny days of late winter or early spring. When summer damage from chinch bugs and/or billbugs is expected, treatment controls adults before eggs are laid. If spring is early, these applications may be needed as early as mid-March. During a late spring, applications may need to be delayed until the last week of March.

However, in most cases, treatment can be delayed until damage signs first appear in June. Retreatment for chinch bugs in middle to late summer may be necessary if reinfestation from adjacent untreated areas occurs.

Preventative treatments may not be successful in southern Florida where the southern chinch bug has multiple generations and is resistant to most organophosphate insecticides in some areas. Replacing susceptible turf with Floratam St. Augustinegrass, a variety resistant to the southern chinch bug, or non-host grasses, will usually provide natural control in Florida.

Grubs—The larvae of this group of pests normally overwinter deep in the soil. If spring comes early, grub activity can be expected along with skunks, raccoons and armidillos tear up the turf searching for the grubs. Moles, who feed on grubs and earthworms, also become active at this time. Late March treatments in more southerly areas may be effective in controlling grubs before they pupate. Warm-season grasses may outgrow spring damage unless severe turf loss has occurred.

Mole crickets—Mole crickets have extended their range from Florida and eastern Georgia into southern Louisiana, eastern Texas and up the East Coast into the Carolinas. Timing of treatments is critical and varies from one area to another.

The tawny and southern mole crickets are the primary pest species. Except for southern Florida, both have one generation per year. Mole crickets become active in March from north central Florida throughout their range in the Gulf States after overwintering in the ground as adults or nymphs. Tunneling damage takes place at night in moist soil and increases as mole crickets become more active. Both mole cricket species begin spring mating flights in late March. In most areas, March treatment is seldom required.

In years when overwintered mole crickets tunnel earlier than normal, treatment has been used with some success. Generally, such applications are better made later in the year when young nymphs are present. Rolling, fertilizing as recommended, and irrigation help keep grass roots in contact with the soils and growing in areas where tunneling damage is observed. Such practices have been successful in some turf areas in speeding the recovery of tunneled areas of warm-season grasses. Care should be taken, however, in rolling areas where compaction is a serious problem.

Spring (April-May)

Chinch bugs and billbugs—As warm days of spring approach, chinch bug and billbug adult movement increases rapidly. Generally, egg laying begins the first week of April on warm-season turf.

Generally, application of insecticides to prevent buildup of chinch bug and billbug populations should be completed by mid-April in the South. Such applications are

The fall armyworm attacks newly established turf from mid-September through October.

The timing of mole cricket treatments is critical in preventing development from egg to adult.

made before significant numbers of eggs are laid. This time may vary as much as a week or more depending on the spring weather. When this approach is not used and southern chinch bugs are detected in May, treatment provides control. In areas with three to five chinch bug generations, turf surrounded by infested, untreated host plants may require one or two retreatments at six-week intervals.

Grubs—Overwintered grubs usually return to the surface and begin feeding on turfgrass roots by early April. Increased activity and damage from birds, moles, skunks, armadillos and raccoons foraging on grubs can also be expected. Feeding by birds, other animals and grubs continues through April.

Infestations of such grubs can also be controlled during early April by spot or general treatment. Treatment should be delayed until grubs are in the top one inch of soil. Irrigation or rainfall should follow such applications. Although milky spore disease products for control of Japanese beetle grubs may be applied anytime there is no frost in the soil, spring is a good time for such applications in areas where Japanese beetle grubs are numerous. The soil is open and frequent rains move the disease spores into the soil and thatch. It should be noted that only the Japanese beetle grub will be affected by milky spore.

Mole crickets—Damage increases in April from north central Florida throughout the southern areas of the Gulf States. Mating and dispersal flights continue as egg laying and hatching begin.

Early spring treatments are sometimes needed in areas that were severely damaged last fall, if overwintered mole crickets are still present. Small damaged areas can be rolled or otherwise packed down so that the turf roots are reconnected with the soil. Early spring damage is due primarily to tunneling. Mole cricket feeding at this time is minimal.

To determine cricket presence, pour soapy water (2 tbs. liquid dishwashing detergent in 1 gal. water) on turf areas where infestation is suspected. Crickets will usually surface in three to 15 minutes (longer in cool weather). Irrigate soap-flushed areas afterwards to avoid sun-scald damage to the grass.

Infested areas should be monitored weekly by soap flushes to determine the presence and abundance of newly-hatched mole cricket nymphs. Nymphs usually hatch in central Florida during April and May. Farther north and west, hatching begins in May and continues through June. Residual treatments and treatments with toxic baits should be made when nymphs are present.

Sod webworms—Overwintered larvae of the sod webworm begin feeding as soon as the grass begins to grow. Usually damage is insignificant, but areas that do not green up may be infested. These areas often have probe holes from starlings feeding on the larvae. Sod webworm larvae can be flushed with soapy water.

In warm-season areas, webworm larvae pupate during late March and early April. Moth flights begin in April in southernmost areas.

Young larvae are usually present about two weeks after the spring moth flight peaks, so treatment of young larvae can be done in May in some areas.

Damage from the burrowing sod webworm may be evident in late May in the South. Rubbing a hand over turf suspected of being infested exposes larval burrows that are covered with a web flap and grass clippings.

When necessary, a wide range of insecticides may be used for control.

Cutworms—Moths of cutworms begin laying eggs on golf course greens and other turf areas in the spring. These eggs hatch, producing larvae that feed on grass blades during the night.

While visible damage is uncommon on home lawns, damage can be significant on golf course greens in May. Cutworm moths seem to prefer egg laying in aerification holes. Therefore, feeding damage by larvae is often associated with the area around the aerification hole.

Black, granulate and variegated cutworm moths become active in March and April in the South. Larvae are present on turf, especially on golf greens and tees. Damage can become evident as early as mid-April. By May, the larvae are large enough to cause severe damage.

To control these pests, apply an insecticide late in the afternoon and allow night feeding cutworms to contact and feed on the treated foliage. Irrigation following liquid application is therefore not advisable unless specified on the product label.

Fire ants—Fire ants are spreading across much of the South. These ants inflict painful stings to man and animals, making them more a "people problem" than a grass problem. They begin establishing new mounds during warm, wet days of spring. During this time, ants are active near the surface of mounds and workers are actively foraging for food.

New mounds may not be visible above the turf surface at this time. Areas heavily infested with old mounds and the less-visible new mounds can be treated broadcast. Individual mound treatments can be made in less infected areas or in areas that are reinfected as the season progresses.

Read the label for specific directions for mound treatment. Do not disturb the mound before or during treatment.

Summer (June-August)

Chinch bugs and billbugs—Southern chinch bugs are not usually a problem in well-irrigated turf or during summers when rainfall is plentiful. Southern chinch bug damage first appears during the dry periods of June and July. Damage may continue through the summer and into the fall because of overlapping generations.

A wide range of insecticides may be used at label rates to control existing infestations. Floratam St. Augustine, a chinch bug-resistant variety, has been a primary turf variety grown in more southern coastal areas and Florida where southern chinch bug is a problem. However, reports indicate that chinch bug feeding has occurred on Floratam in some locations in south Florida.

Billbug grubs are usually large enough to be found in the soil by late June. Areas of turf where adult billbug activity has been observed earlier should be examined routinely. Zoysia and Bermudagrasses are especially susceptible to infestation. Turf that does not hold together, does not respond to fertilization normally or appears to be drought-stressed in spite of irrigation may be infested. If drought conditions exist, water prior to and after treatment.

Grubs—Beetle flights continue and often peak in June, although the time flights occur varies from year to year. Japanese beetle flights occur mainly from middle to late May and June. Brown May or June beetle flights often follow heavy rains in late May and June. New generation grubs of most southern species can be found by middle to late August.

Check areas that were grub-damaged in the spring or in the spring or in previous

Handle your grub situation fast, before things get really ugly.

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Circle No. 137 on Reader Inquiry Card

WARM-SEASON*	LATE WINTER (Mar.)	SPRING (Apr.-May)	SUMMER (June-Aug.)	FALL (Sept.-Oct.)
(SOUTHERN) CHINCH BUGS	In southern Fla. where resistance is a problem, use Pydrin, Pounce or Baygon as labeled for Fla. Replace susceptible turf with resistant or non-host varieties to provide natural control. In other areas, overwintered adults can be treated if they become active in March with diazinon (4 lbs. AI/acre), Dursban (1 lb. AI/acre) or Oftanol (2 lbs. AI/acre).	Application to prevent population build-up should be made by mid-April. Diazinon (4 lbs. AI/acre), Dursban (1 lb. AI/acre) or Oftanol (1-2 lb. AI/acre) provide control.	Control existing populations with Dursban (1 lb. AI/acre), diazinon (4 lbs. AI/acre) or Oftanol (1-2 lb. AI/acre) when damage signs appear. Southern chinch bugs are not as severe a problem in well irrigated turf.	Late summer applications usually make fall treatments unnecessary.
BILLBUGS	Treatment at this time can be done if adults are numerous and active. Use diazinon (4 lbs. AI/acre), Dursban (1 lb. AI/acre) or Oftanol (1-2 lb. AI/acre).	Treat when adults are active to prevent population buildup. Diazinon (4 lbs. al/acre), Dursban (1 lb. AI/acre) provide control.	Treat billbug grubs with Oftanol (2 lbs. AI/acre) if not used in spring; diazinon (5 lbs. al/acre) Turcam (2 lbs. AI/acre). Triumph 4E (restricted—home lawns only, not on "sandy" soils—2 lbs. AI/acre/season). Irrigate following application; also before if drought exists.	If necessary, treat with diazinon, Turcam, Oftanol or Dylox/Proxol as in summer.
GRUBS	Control with insecticides usually does not extend to new generation in July and August.	Infestations can be controlled during early April by spot or general treatment with Turcam (2 lbs. AI/acre), Proxol/Dylox (8 lbs. AI/acre) or diazinon (5 lbs. AI/acre). Mocap granules (5 lbs. (AI/acre) can be used on golf courses and sod farms. Triumph 4E on home lawns only, not on "sandy" soils (restricted use, up to 2 lbs. AI/acre/season) Sevin (1.5-2 lbs. AI/acre) or Orthene 75S (1.5-2 lbs. AI/acre, unirrigated after treatment) is effective on green June beetle grubs; Sevin (8 lbs. AI/acre) against other grubs. Irrigate after treatment. Milky spore can be applied in early April for Japanese beetle control in areas where the grubs are numerous.	New generation grubs present in late July or by mid-August can be controlled with Proxol/Dylox (8 lbs. AI/acre); Turcam (2 lbs. AI/acre); Oftanol (2 lbs. AI/acre); diazinon (5 lbs. AI/acre); or Mocap granules (commercial turf only at 5 lbs. AI/acre). Triumph 4E (restricted use, home lawns, not on "sandy" soils, up to 2 lbs. AI/acre/season). Sevin SL (8 lbs. AI/acre) is effective against most grubs; Sevin SL (1.5-2 lbs. AI/acre) or Orthene 755 (1.5-2 lbs. AI/acre, unirrigated after treatment) is effective against green June beetle grubs. Water immediately after treatment, also before treatment during dry summers.	Treatments are effective as late as mid-October. Irrigate first if soil is dry, then again after treatment.
SOD WEBWORMS	Treatment is not appropriate at this time.	Use diazinon (4 lbs. AI/acre), Dylox/Proxol (3.5 lbs. AI/acre), Dursban (1 lb. AI/acre), or Sevin (6-8 lbs. AI/acre) in April when larvae are present. Warm season grasses outgrow moderate damage, so treatments can be delayed until summer.	Make application to infested turf when larvae are present or two weeks after peak moth flight. Use diazinon (4 lbs. AI/acre), Dursban (1 lb. AI/acre), Dylox/Proxol (3.5 lbs. AI/acre) or Sevin (6-8 lbs. AI/acre).	Treatment in early September may reduce population for next season.
CUTWORMS	Treatment usually is not appropriate at this time.	Use Dursban (1 lb. AI/acre), Dylox/Proxol (3-8 lbs. AI/acre) or Sevin (2-4 lbs. AI/acre). Apply late in the afternoon. Do not irrigate unless specified on label.	Although cutworms in the South are usually a spring problem, if summer infestations occur, treat as directed for spring.	Treatment usually is not necessary at this time.

MOLE CRICKETS	Timing of treatments is critical and varies in different areas. In years when activity of overwintered mole crickets resumes early, treatment with Orthene 755 (3.5 Al/acre) or Turcam (2 lbs. Al/acre) is sometimes effective. Extensive treatment should be delayed until young nymphs are present. Rolling, fertilizing and irrigating warm-season grasses helps tunneled turf to recover.	Monitor infested turf weekly with soap flushes to determine presence and number of young nymphs. For short-residual treatment of overwintered crickets in April use Turcam (2 lbs. Al/acre, irrigate after treatment); or Orthene 75S (2-3 lbs. Al/acre) on wet turf, unirrigated after late afternoon treatment, provides quick knockdown. Baits are effective in central Florida in May when young nymphs are present. Begin monitoring damaged areas for newly-hatched nymphs.	For residual control, use Oftanol (2 lbs. Al/acre) or Mocap granules (10 lbs.) or Turcam (2.5 G, 2 lbs. Al/acre) on young nymphs. Irrigate immediately. Baits are effective from central Florida northward during summer. Baits available are Baygon 2% (½ lb./1000 sq. ft.): .5% Dursban (150 lbs./acre or two applications of 75 lbs./acre three weeks apart); malathion 2% (100 lbs./acre or two applications of 50 lbs./acre three weeks apart). Irrigate several hours before bait applications, and do not irrigate afterwards. Orthene 75S (2-3 lbs. Al/acre) can be used during summer, applied on irrigated turf late in the day and unwatered overnight. Triumph 4E (home lawns only, up to 2 lbs. Al/acre/season) can not be used on "sandy" soils.	Sprays of Turcam (2 lbs. Al/acre) or Orthene 75S can be used in areas where outbreaks occur and may have to be repeated several times. Mocap granules (10 lbs. Al/acre, commerical turf only) may be used, but don't use either more than once per season. Do no expect excellent late-season control if earlier measures have not been taken.
TWO-LINED SPITTLEBUG	Treatment is not appropriate at this time.	Treatment usually not necessary at this time. Dethatching turf when appropriate may reduce populations.	Mow, irrigate several hours or the day before treating infested turf. Spray with diazinon (4 lbs. Al/acre) or in less thatchy turf with Dursban (1 lb. Al/acre). Use at least 10 gal. water/1000 sq. ft.	Re-treatment is usually unnecessary. Treat in pested areas in September if necessary as described for summer.
FALL ARMYWORM	Treatment is not appropriate at this time.	Populations usually do not develop until summer.	Treatments are most effective in early morning or late afternoon. Use diazinon (4 lbs. Al/acre), Dursban (1 lb. Al/acre), or Proxol/Dylox (1-3 lbs. Al/acre).	Apply as directed for summer. Fall armyworms may be a greater problem in Sept.-Oct. than earlier.
FIRE ANTS	Treatments are less effective when soil temperatures are low.	Area treatments when new mounds being established in heavily infested areas with Amdro bait (1.5 lbs. bait/acre), Pro-Drone bait (.88 lb. bait/acre), Logic bait (1-1.5 lbs. bait/acre) Affirm bait (1 lb. bait/acre) or Oftanol (.05 lb. Al/1000 sq. ft.) are effective. Mound treatments in less infested areas include various diazinon or Dursban formulations; Orthene 75S dust (2 tsp./mound); or MC-96 mound fumigant (2 fl. oz./mound).	Treat mounds as they appear with various formulations of diazinon or Dursban; Orthene 75S dust (2 tsp./mound) or MC-96 (2 fl. oz./mound).	Apply controls to mounds or areas early in the morning or late in the day, as described for spring and summer. Area treatments with baits may be done in heavily-infested areas. Irrigate dry areas or wait until rain before treating if drought conditions exist.
SCALE INSECTS	Treatment is not effective.	Chemical control for ground pearls is not effective at any time of year. Proper fertilization, disease controls and adequate irrigation is the best defense.	To control Rhodegrass scale, apply diazinon (5 fl. oz./1000 sq. ft./25 gal. plus wetting agent). Retreatment is usually necessary.	Treat as directed with diazinon for summer.

*See accompanying text for details; always follow label directions.

years. Although grubs will be small in August, they can still be found in infested areas. Extreme heat and drought during the summer may cause some grubs to move deeper in the soil. Under such conditions, irrigate several hours before treatment. A thorough soaking afterward is also advisable.

Mole crickets—Egg hatching diminishes in late June, and newly-hatched nymphs of both species feed voraciously. Tunneling damage suddenly becomes obvious in July as the nymphs grow larger. Because of the potential for sudden damage at this time, turf areas should be inspected several times a week during this period.

Bait formulations are effective in controlling mole cricket nymphs from June through August in the area from central Florida north and west through the Gulf States. Baits work best in eastern Georgia during spring and fall. Bait applications usually must be repeated one or more times.

Mole crickets are more active at night in moist soil. Turf should be irrigated several hours before baits are applied. Delay application until later in the day, and do not irrigate for two to three days thereafter.

Residual control of mole crickets may vary with location, irrigation and amount of rainfall. In some cases, Oftanol has not performed as effectively as expected, nor as consistently as it once did in these same locations. Residual controls work most effectively on younger mole cricket nymphs. Treatments should be watered immediately. Residual controls should be applied in June or July.

Less residual treatments include sprays with Orthene 755. Turf should be irrigated before treatment and Orthene sprays applied late afternoon or evening. Turf should then be allowed to dry before further irrigation.

Orthene sprays seem to be more effective on mole cricket nymphs that are at least two weeks rather than newly-hatched nymphs. Orthene sprays in 1987 seemed most effective in the mid-Gulf States from mid-July through September.

Sod webworms—Most sod webworms complete at least three generations a year with overlapping generations toward the end of the season.

Damage is most severe from late June through August. In southern Florida where the tropical sod webworm is active throughout the year, damage is most severe in late summer and fall.

Hybrid Bermudagrasses are favored by sod webworms, but damage occurs on other warm-season grasses. Webworm damage to Bermudagrass often superficially resembles symptoms of some diseases. Flushes of soapy water can be used to determine the presence of sod webworm larvae.

Insecticide applications should be made when larvae are present and/or one to two weeks after peak moth flights from infested turf.

Retreatment may be needed, depending upon the location and number of generations.

Two-lined spittlebug—Spittlebug nymphs (immatures) are primarily lawn pests, but recently damage to other turf areas has been reported. Any area with thick turf, thatch accumulation and high humidity is susceptible to spittlebug damage. Nymphs that hatch in the spring from overwintered eggs usually cause no noticeable damage until June or later. Adult spittlebugs are especially attracted to and damage Japanese hollies and may move from these shrubs to surrounding turf to lay eggs. The two generations have a year overlap so that by late summer all stages may be present.

Infested turf may develop yellow spots or larger areas in which the grass eventually dies. This damage is caused by spittlebug nymphs extracting sap from grass plants located in "spittle" masses deep within the turf. If population density is great, the spittle masses that surround nymphs may result in "squishy" feeling turf when walked on, somewhat as if shaving from underneath.

Thatch control may disrupt the humid environment necessary for spittlebug development. Infested areas should be irrigated before treatment. Clippings should be collected and destroyed.

Fall armyworm—In the South, summer always means the arrival of the moths of this migratory pest. Although in mild winters fall armyworms may overwinter along the Gulf Coast, it is generally believed that the moths are blown in on winds from Central and South America. Several generations occur each season, one about every five weeks. Generations overlap in the fall.

Lush, green Bermudagrasses are preferred. By late June, fall armyworm damage to turf has usually been reported along the Gulf Coast. Damage is seldom permanent, unless drought and/or heat stress follow.

Fall armyworms may feed anytime during the day but are most active in the early morning and late evening.

Treatment is most effective at these times. During hot, mid-day hours, larvae may retreat into the thatch.

Fire ants—Fire ants are more difficult to control during hot, summer days because they are deeper in the soil. However, during rainy periods, they may become active and establish new mounds. Treatments during these months should be applied early in the morning before the heat of the day. Treat mounds as they appear.

Scale insects—Although Rhodegrass scale is present in Gulf Coast areas throughout the year, damage becomes most pronounced during the hot, dry days of summer. Bermudagrass and St. Augustinegrass are preferred hosts, but other grasses are also infested. Repeated treatments are required for control to be effective.

Ground pearls are scale insects that live in the soil throughout the year, sometimes eight to 10 inches deep. In the spring, eggs hatch producing nymphs that feed throughout the summer by piercing turf roots and extracting plant fluids.

Chemical control for ground pearls has not been effective at any time of year. Damage is most severe during summer months when the turf is stressed from heat and drought.

Centipedegrass is especially susceptible to damage, particularly when weakened by over-fertilization or drought. Proper fertilization, disease control and adequate irrigation to maintain healthy turf is the best defense.

Fall (Sept.-Oct.)

Chinch bugs—Damage by the southern chinch bug may continue in untreated areas. Late summer applications of insecticide usually make fall treatment unnecessary.

Grubs—Most species of grubs are in the third of their three stages of development and are feeding actively. When soil temperatures decrease in late October, and November, the larvae burrow deeper into the soil to overwinter. Severely cold winters have little effect on survival.

Treatments of existing grub infestations can be accomplished as late as mid-October, using standard grub insecticides. Treatment after this time may or may not kill the grubs before they move deeper into the soil to overwinter.

If the soil is dry, irrigation before treatment is advisable. Whenever treatment is applied, the grubs should be in the top one to two inches of soil.

Mole crickets—Mole crickets fly again in the fall, but no egg laying is known to occur at this time. The crickets are large and difficult to control in the fall. Damage becomes more severe as turf growth slows and cricket size increases. Some insecticides may work too slowly for adequate control of large crickets in October. Residual insecticides such as Mocap and Oftanol are less effective than when applied in late June or July. Orthene 755 can be used effectively into October most years, but toxic baits become ineffective by October in most areas.

Sod webworm—Except for the most southern areas where development is continuous, sod webworm larvae present in September will overwinter. Areas treated earlier in the season may be reinfested by this time. Treatment in early September may reduce the next season's population.

Fall armyworm—Fall attacks on newly-established turf from mid-September through October may result in damage that will not recover with fall fertilization. This forces the turf to enter winter in a stressed condition.

If needed, apply controls early in the morning or late in the day when fall armyworms are most active.

Fire ants—Hot, dry periods in September and October may make fire ant control difficult. Once rain begins, fire ants become active and may be effectively controlled with mound treatments. Area treatments may be desirable in heavily-infested areas with baits. **LM**

Pat Cobb, Ph.D., has been at Auburn University for 11 years, she received her B.S. degree from Huntington College and her M.S. and Ph.D. from Auburn.

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Circle No. 158 on Reader Inquiry Card

THE TIME MACHINE

That's what the busy businessman is asked to be on a daily basis. If your 'time machine' is sputtering along, here are some tips designed to get it hitting on all eight cylinders again.

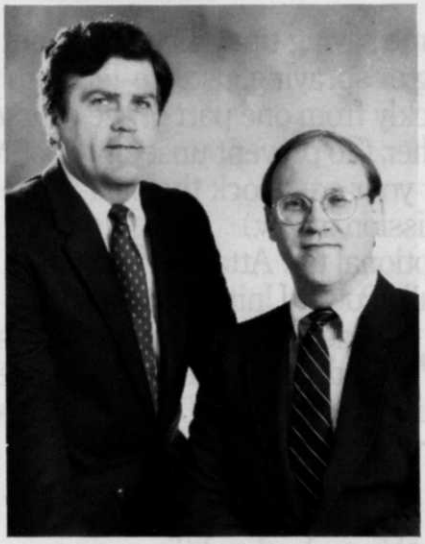
by Rudd McGary and Ed Wandtke

MANAGEMENT IN BUSINESS

One of the most common complaints in the green industry is the lack of time available to complete all the tasks involved with being in business. This is particularly true at the beginning of the season. This is the time when everything comes at you all at once and there never seems to be enough time to get everything done. Here are some ideas that may help you get a little more control of your time. They won't help you do your job, but at least they will help you cope with time.

1. Set priorities. There must be some set of priorities for the tasks you are expected to perform. Some tasks are needed for the running of the organization. Make sure you attend to these first. Write down a ranking of those tasks which are the most important and make sure that you keep coming back to those as you have free time.

2. Look at the tasks you have to do to let others do their jobs. First make sure that you know which ones are critical for other people to complete their jobs. Try to get these done early in the day. This way, they won't be as likely to call you during the day to ask questions about information they need to get their jobs done.



Wandtke and McGary are senior consultants with All-Green Management Associates in Columbus, Ohio. Dr. McGary focuses on marketing and managenent issues. Wandtke focuses on operations and financial questions.

3. Delegate jobs that can be done by others. A lot of managers, particularly in small companies, feel that they are the only ones capable of doing most tasks. Usually, this isn't true. You should make a list of work for the day and then decide whether or not you personally have to do them all. Most of the time, you don't.

4. Keep a pen and some paper by the phone. If you find that you spend a great deal of time on the phone, you will find that the pen and paper help. When someone calls, write down the reason for the call. Keep that in front of you as you talk and you will be able to keep the conversation to the point. Most people will tell you why they are calling in the first 30 seconds. Write this down and keep working on it.

5. Keep a timer by the phone. The pen and paper will help, but if you put a timer by the phone, you'll start saving time on each call. Get yourself a three- or five-minute timer and you can learn to get off the phone in a short period of time. Most phone conversations take too long. By forcing yourself to recognize the time spent on the phone, you can get some of it back.

Most people will tell you why they are calling in the first 30 seconds.

6. Learn to say "no." If you're in your office or on the way to do something that needs to be done and someone asks if you have a few minutes to talk, say "no." Then give them the reason and a time when you will be available. By making sure you complete your most important tasks, you'll get your job done more effectively. People will understand that you are just trying to do the most important tasks for the day.

7. Put agendas together for any formal meetings. If you have to meet with others in the organization and the meeting is pre-planned, have an agenda. Make sure that each section of this meeting is timed, and stick to it. A lot of time is lost in meetings when there is no timing attached to a given topic. The meetings have a tendency to go on and on and generally accomplish about the same as a meeting that takes one-half the time.

8. Write down what you have to accomplish in the course of the day. If you can anticipate, to some extent, how much you have to do, you may find that you actually get it done. In addition to writing down what you have to do, write down how long it should take. This requires discipline, but if you want to get some time back, you should get used to doing it.

Summary

Most of time management deals with being aware of the places where time slips out of your control. By looking at the eight ideas above, you will have better control of your time and be aware of the various tasks that you have to perform. There is no one way to be sure of total time management. But by going through a variety of disciplines, you may find that you have better control of your time and are able to do your job better and more efficiently. **LM**

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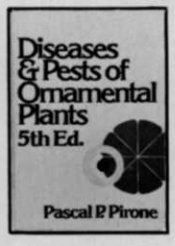

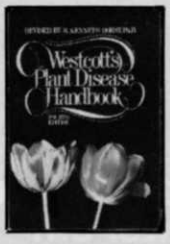

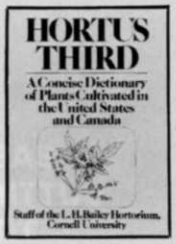

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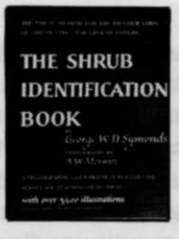

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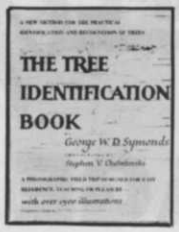

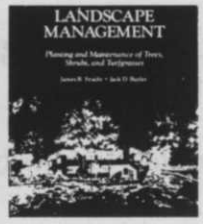

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Circle No. 136 on Reader Inquiry Card

MANAGE YOUR TURF, MANAGE YOUR SOIL

Although the turf is what you see, you might have to get to the root of your problems through the soil.

by Paul E. Rieke, Ph.D., Michigan State University

Most of our efforts in turf management are based on how the above-ground portion of the plant responds to the practices followed or different stresses. The stems and leaves provide the beauty and functional aspects of a quality turf.

While deserved attention has been given to the above-ground portion of the turf, what happens in the soil is receiving greater attention as well. Soil provides water, nutrients and air to the plant roots. Soil also serves as the medium for rooting.

A healthy soil is a very complex system involving physical, chemical and biological systems. Each of these systems is complex in its own right, but they each interact on the others, as well as with the plant tissue above ground.

Sod place on this compacted clay loam subsoil develops its own growing medium—thatch.

Physical soil management

Texture and structure are soil's primary physical components.

Soil texture tells us about the amounts of sand, silt and clay in the soil which affect water holding capacity, drainage, aeration, space for roots and susceptibility to compaction.

Structure is a general term referring to the way the soil particles are put together. The traditional "ideal" soil consists of 50 percent solids, 25 percent small (or micro) pores for water holding capacity and 25 percent large (or macro) pores for drainage, aeration and easy rooting.

These numbers assume a loam soil with excellent structure. Such conditions seldom exist under turf conditions, especially on intensely-trafficked sites. So frequently the turf manager must maintain the turf on poor quality soils and/or where traffic results in compaction.

Compacted soils lose their larger pores, reducing drainage, aeration and rooting. Recent research by Robert Carrow, Ph.D., and co-workers proves that compacted soil conditions result in more roots in the surface soil but fewer roots deeper in the soil.

This clearly reduces the reservoir from which the plant can extract water. The turf is thus more susceptible to stresses—especially moisture stress. Sandy soils have a high percentage of larger pores but hold less water than finer textured soils.

The rapid drainage and good aeration conditions in a sandy soil normally permit use of a turf area soon after rainfall or irrigation. For this and other reasons, the preferred soils for high traffic areas are high sand content mixes.

While a soil-based mix (such as the USGA mix) is considered most desirable by this author, it is sometimes difficult to find adequate amounts of quality topsoil to use in the mix. The ultimate mix is often variable due to poor mixing techniques.

For this reason, many architects and construction firms prefer to use sand/peat mixes containing no soil. While this provides an easier approach to construction, management will be more difficult. More careful attention must be given to water and fertilizer rate and frequency. It is more difficult to overseed successfully on high sand soils. The playing surface can be very hard on sands, especially when the soil is dry.

The soil mix selected for a given site should be planned carefully. Then that plan should be followed closely. Often we find great attention is given to seed selection while soil conditions are taken for granted. Once the soil is in place, it cannot be changed without costly reconstruction efforts.

There are alternatives for improving a poor soil.

Top dressing is used widely on greens (golf, bowling, tennis) and to a limited degree on athletic fields. Careful attention must be given to select-

continued on page 75

ing proper top dressing material, appropriate timing and rate.

Do everything possible to prevent the development of layers in the soil. Differing layers can result in a perched water table and limitations on rooting, drainage and aeration. Detrimental effects of layers could occur short-term but usually will not be too evident until several years later.

Another alternative for improving compacted soils is cultivation, to till or loosen the soil without seriously affecting the turf surface. Loosening the soil provides improved infiltration, drainage, aeration (exchange of gases between the soil and the atmosphere) and rooting.

Cultivation also brings soil to the surface so it may be worked back into the thatch, theoretically providing a better medium for microorganism activity and thatch control. On golf greens, cores are often removed before top dressing. This permits a gradual change in soil conditions.

Some factors to evaluate in your cultivation program include spacing of aeration holes, depth of holes, type of tine or spoon, type of aerifier action, amount of soil brought to the surface, speed of unit and cost.

Be sure the unit you are using is doing what you want. Many turf sites do not need cultivation, while others may require very aggressive treatment.

A compacted soil cannot be corrected in a single treatment. Cultivation should be viewed as a long range program. Turf managers should sell the program on that basis whether for home lawns, grounds, athletic fields or golf courses.

Other helpful practices in high-traffic areas include changing traffic patterns, restricting traffic when soils are wet, using paving blocks or alternate surfaces, planting wear-tolerant grass species, using adequate potash, and mowing the grass at a higher height if feasible.

Irrigation/wetting agents

Another facet of soil management is irrigation. The turf manager must know the basics of irrigation:

1. How deep are the roots which are effective in water uptake?

2. What is the available water holding capacity of the soil? (Using 1 and 2 above he can then determine how much water is available in the root zone.)

3. How much water is lost by evapotranspiration each day?

4. What are the "indicator" spots where moisture stress will show first?

The last factor could be affected by soil variability, slope exposure, irrigation system design, wind effects, traffic, disease and other factors which could affect rooting or water movement in the plant.

Wetting agents can be a very helpful tool in soil water management.

For example, if susceptibility to hydrophobic soil conditions occurs, wetting agents can help re-wet the dry soil. Cultivation and careful watering practices can also help to deal with these localized dry spots.

Since wetting agents vary widely in composition, be sure to check whether the wetting agent you are using is effective for the objective you have in mind.

Some wetting agents are more likely to cause phytotoxicity than others. Our recommendation is to water the turf lightly, apply wetting agent and water with at least ¼ inch of water. This should reduce the potential for injury. Use special care when using wetting agents during hot weather conditions.

Chemical soil management

continued on page 77

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SOILS *from page 75*

Soil properties which are considered chemical in nature are pH control, available nutrients, cation exchange capacity and soluble salts and sodium. Control of soil pH is frequently overemphasized. But pH adjustment must be done with care.

Generally, raising pH by liming is relatively simple. Ground limestone is safe to use on turf. In most cases, dolomitic limestone is preferred because of its magnesium content, but soil should be tested to be sure. Hydrated lime, which can cause phytotoxicity, should be used carefully.

Gradually the lime, placed on the surface where it neutralizes soil acids, is dissolved and moves lower into the soil. In fine textured soil, this process can take two years or more to have any impact on pH more than three inches below the surface.

Nitrogen fertilization is a major soil management practice on turf. Knowledge of the growth patterns, physiology, susceptibility to diseases and environmental stresses are necessary for its wise use.

Additionally, as an industry we must use proper carriers, rates and timing of nitrogen to prevent nitrate leaching at levels which could pollute groundwater. The February issue of LANDSCAPE MANAGEMENT provided good coverage on N fertilization.

It is best to use soil tests for phosphorus needs. This is especially wise for turfs along lakes and streams which could experience algal bloom problems with enough phosphorus pollution. Following soil test recommendations for phosphorus should prevent pollution when it is used.

Potash has become the "newly-found" nutrient in turf management, based on reports of improved tolerance (wear, moisture stress, rooting and disease pressure) when high K levels are applied.

While there are many good reasons to use K, remember that nutrient balance is still essential. Most turf specialists would not exceed a 1:1 ratio of N to K_2O on an annual basis. This depends on the annual N rate, however. Some golf course superintendents in the north are using less than 2 lbs. N/1000 sq.ft. annually, especially on sandy greens. Under such conditions, one would surely want to be using 4 lbs. K_2O or more annually.

Be careful to keep a balance between potassium and magnesium. Test the soil to be sure the rates between these two nutrients is not more than 4:1 or 5:1 (Mg:K_2O) on sandy soils. And on sandy soils we need to "spoon feed" potash, since there is limited cation exchange capacity to hold the K ions in the soil.

Other nutrients used on turf include sulfur, iron and other micronutrients. The response to these nutrients will vary with turf and soil conditions. The turf manager should be familiar with local conditions dictating the need for these nutrients. Managing turf soils when soluble salts (saline) or high sodium (sodic) conditions exist requires evaluation of both physical and chemical soil factors.

The importance of irrigation water quality and volume, drainage and—in the case of excess sodium—the use of gypsum, must be understood to deal with these problems. Wise use of soil tests is essential for proper management of saline and sodic soils.

Biological soil management

Biological soil components include the activities of both desirable and undesirable organisms. The decomposition of soil organic matter and release of nutrients and other materials to help maintain good soil structure are desirable.

Thatch decomposition is accom-

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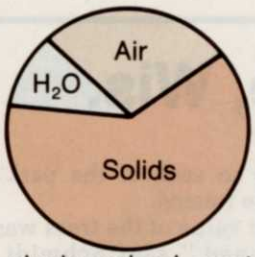
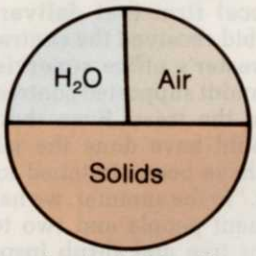
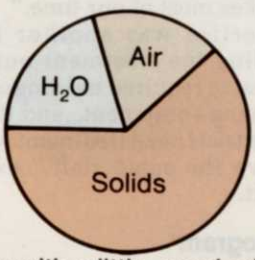


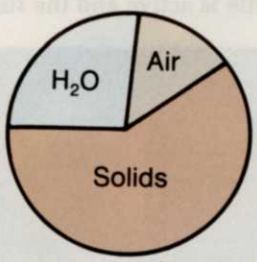
single grained sand



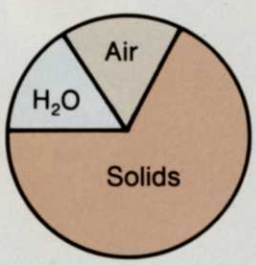
typical "ideal" loam soil with good structure



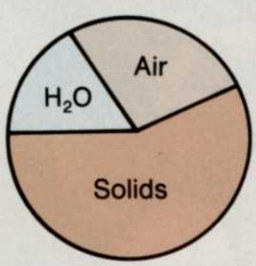
loam with a little sand added



compacted loam



wide particle size range sand



loam with enough sand added to permit bridging of sand particles

plished by a range of soil organisms from large, like earthworms, to the smallest bacteria.

Another desirable activity of soil organisms is their ability to biologically break down certain pesticide residues. This helps prevent accumulation of pesticides. This would be undesirable, however, if the pesticide's residual activity is shortened enough to make its use impractical.

Other detrimental activities are caused by pathogens, insects and nematodes. Some of these may be active on the grass above the soil, while others are primarily active in the soil. Knowledge of their life cycles and the effect of soil management practices on their activity will help keep the impact of these pests at a minimum. In the past, major emphasis has been placed on chemical control of most turf pests.

As this science of turf management improves, we are learning more about the impact of fertilization and watering on pest management. Coupled with predicting pest problems more

continued on page 86

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Elm trees fight back in Eau Claire, Wis.

Tees, equally spaced along the elm's root flare, are connected with short lengths of tubing.

There's no cheer in the bright orange markers on the tall gracious American elm trees in Eau Claire, Wis. They tell a grim tale: the continued deaths of irreplaceable elms to Dutch elm disease (DED).

The numbers have been devastating since 1980: between 1,280 and 2,150 elms have been lost each year. In 1960, about 40,000 elms graced Eau Claire, according to city forester Rod Schmidt. He estimates that surviving elms number approximately 12,000. Across the northern U.S., more than half the elms have succumbed since the late 1950s, according to industry experts.

In Owen Park, an Eau Claire centerpiece, the number of elms has dwindled from approximately 200 in 1976 to approximately 100 today. In this one-of-a-kind park, the fungus' spread has been effectively halted with an intensive sanitation and fungicide treatment program.

In the past three years, the program has reduced losses to only three elms.

The whole city began experiencing extremely heavy losses with a 1980 windstorm—"a terrible disaster" Schmidt says. Fresh wounds in the elms attracted elm bark beetles which spread the fungus that causes DED. The beetles breed in elms that are weakened, dying or dead and in cut elm wood with firmly attached bark.

Clean-up after the storm took 2[4] years. Meanwhile, losses of elms citywide skyrocketed from approximately 500 in 1980 to 1,450 in 1981.

High priorities

Control of DED in Owen Park became a priority for the Eau Claire City Council. The scenic 50-acre park covers a two-by-six-block stretch along the picturesque Chippewa River near downtown Eau Claire.

The 60-year-old, 50-foot elms shade the annual art fair, "Sawdust City Days" activities, picnickers and joggers. They form a scenic backdrop for parades, weekly band shelter concerts and film features.

"You don't see a stand of elms like that any more. Nice...leafy...mature. They make the park and community special. And we'll go the extra mile to take care of them," explains city council president Wallace Rogers.

In 1984, the city council approved the first treatment of the park's elms with Arbotect (thiabendazole) fungicide. In 1987, when the treatment needed to be repeated, cost was not a concern. The city council allocated $5,000 more than the budgeted $12,000 so each of the park's elms could be treated.

"The value of the trees was never questioned," says Schmidt. "The council just said: 'Let's do it.'"

A local firm that delivered the lowest bid received the contract. The city forester's office supervised the job. Schmidt supported contract treatment of the trees. Even though his staff could have done the job, they would have been stretched too thin, he says. "In the summer, we have four permanent people and two temporaries for tree and shrub inspections and evaluations, consultations with property owners and tree removals. That takes most of our time."

Expertise was another factor. "Handling the treatment ourselves would have required training our staff and buying equipment...and the next time the trees need treatment, we may not have the same staff," explains Schmidt.

The program

The trees were treated in July, when the beetle is active and the fungus is

Rod Schmidt, Eau Claire, Wis. city forester, checks the injection equipment pressure before injecting Arbotect into an elm.

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Circle No. 241 on Reader Inquiry Card

growing. Sod and soil were carefully removed from the tree's base, so as not to scrape or injure the elm. The fungicide was injected into the tree's root flares. It flows evenly through the xylem throughout the tree's crown and branches.

The amount of Arbotect injected varies with each tree's diameter at breast height, 4½ feet from the ground. The diameter determines the number of injection sites—1½ to 2, each one inch deep for each inch in diameter.

Shortly after the injection sites are drilled, tees are inserted and connected with short lengths of tubing. This "harness" is attached to a supply hose that is connected to a container of Arbotect and water. After trapped air is removed from the lines, the fungicide is injected under 5 to 15 lbs. of pressure.

Following injection, the tees are removed and the excavation is refilled. Equipment is cleaned and sanitized between trees.

Two elm bark beetles—the smaller European elm bark beetle and the native elm bark beetle—spread DED. Spores stick to hatching beetles and are carried to new trees as beetles emerge in May and June and begin feeding.

The European beetle feeds in the crotches of living elm twigs; the native beetle feeds in bark of two- to four-inch branches. They usually feed within 1,000 to 1,500 feet of where they hatch. However, beetles may rise to altitudes of several hundred feet and be carried by air currents for many miles.

Infected trees first show wilting, curling and leaf yellowing on one or more branches in the upper portion of the tree. Large trees may show symptoms of DED for one or more years before dying. Ideally, newly-infected trees should be removed within two weeks of disease identification.

The fungus also spreads through the adjoining roots of elm trees within 40 feet of each other. According to experts, the likelihood of root graft increases with delays in removal of infected elms.

Once a tree is removed, unremoved roots will continue to live and send up new shoots. "As long as the roots are alive, the fungus is alive," says D.W. French, Ph.D., plant pathologist at the University of Minnesota. Trees infected through root graft wilt and die rapidly, he says. Ideally, roots of infected trees should be severed mechanically 36 to 48 inches below ground.

Lines of defense

Sanitation is the first line of defense against DED, according to French. "Eliminate all dead and dying elms where beetles reproduce and the fungus resides."

Pruning may be the next line of defense if the main stem isn't infected, according to Dr. French, but pruning may not be popular. "My experience in Eau Claire," Schmidt says, "is the more cuts on a tree, the more likely you'll lose it. We sanitize as fast as we can and encourage treatment with Arbotect to protect against infection.

"We're really limited in our selection of replacement trees for the elms because of the zone 3 climate, soil and urban setting here," he says.

Because American elms are no longer available at nurseries, city residents settle for Marshall seedless ash, summit green seedless ash, Norway maple, linden and a few honey locust, flowering crabs and Canada red cherry trees. French recommends native oak trees, but not the pin oak.

"But, there's nothing close to the remaining elms, especially those in Owen Park," says Schmidt. **LM**

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1987 Landscape Manager of the year
Michael Hugg

Entry forms are now being accepted by the Professional Grounds Management Society and Landscape Management magazine for their second annual "Landscape Manager of the Year" award.

Purpose of the award is to recognize superior job performance among landscape managers, to challenge those involved in the industry to achieve higher standards of excellence, and to bring national recognition to deserving managers.

Any person directly responsible for the professional maintenance of one or more landscapes is eligible to enter. Applicants will be judged according to job performance, honors and awards, procedures and philosophies, and contributions to the green industry. Applicants will be asked, at the time of entry, to submit four 5 x 7 black-and-white glossy photos and 10 color 35mm slides of current work areas with a short narrative on each.

(clip and mail)

Applicant's name **Title**

Applicant's company

Official entry form should be sent to:

Name **Title**

Company

Address **City/State** **Zip Code**

Mail to: PGMS, Landscape Manager of the Year, 1201 Galloway Ave., Suite 1E, Cockeysville, MD 21030

PRODUCTS

Computer program benefits golf course superintendent

Parr Plus computer programs from Leisure Time aim at helping various management aspects of the golf course superintendent.

Six programs are currently available: employee management; budget control; inventory control; chemical/pesticide use; equipment management; and labor tracking.

All programs are written in DBASE and are IBM-compatible.

Circle No. 190 on Reader Inquiry Card

Barge maneuvers for aquatic weed control

Aquatics Unlimited's Aquamog multi-purpose maintenance rig is a self-powered maneuverable barge with a backhoe type arm for dredging and emergent and subemergent aquatic weed control.

The storage deck can be used to transport cut weed growth. The Aquamog works in water as shallow as two feet and the arm can reach 18 feet out of the water to trim shore vegetation with attachments like a

flail mower.

Circle No. 191 on Reader Inquiry Card

Programmable controller uses 'word-type' display

Marcom Industries' new Irrigate-All irrigation controller is field-programmable, using a "word-type" display and six keys. Automatic, semi-automatic and manual controls are available for all circuits.

Features include control inputs from sensors and instruments for more precise irrigation, restricted access, and programming times absolute or adjustable for sunrise and sunset.

Programming can be reviewed and changed sequentially or by circuit number, which allows programming that affects a specific irrigation zone. Programming can control any of eight available circuits with no minimum or maximum number of programs per zone. All circuits are capable of directly driving motors, pumps or valves.

Circle No. 192 on Reader Inquiry Card

Reinforced plastic grid supports heavy traffic

Presto Products' Geoblock Landscaping System is a lightweight, reinforced plastic which interlocks to create a strong, flexible pavement to support vehicular and heavy pedestrian traffic while maintaining turf quality.

Geoblock can be used on access roads, parking lots, footpaths and golf car paths. It is available in 12 x 36 x 1⅛

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-inch and 12 x 36 x 2-inch sizes. The block can be cut with hand or power saw for custom fit around corners or objects.

Circle No. 193 on Reader Inquiry Card

Subsurface irrigation works at the root zone

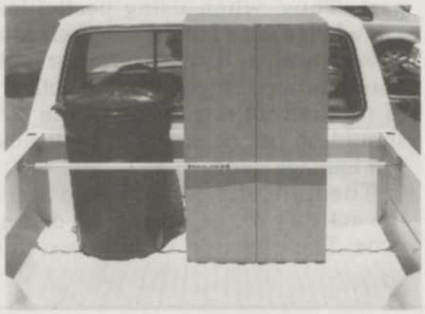
The Aquapore system from Moisture Systems uses a porous commercial grade rubber tubing with a sweating system that dispenses water evenly with wick-like action. Capillary action of the soil draws moisture from the tubing, replacing water used by trees, turf and other plant material. This method takes water, oxygen and nutrients uniformly through the soil directly to the roots.

The system is totally underground and automatic. According to the company, the system cuts replacement plantings and callbacks due to improper watering by 70 percent. Watering directly in the root zone encourages deeper root growth and eliminates wet/dry cycles and reduces stress.

Circle No. 194 on Reader Inquiry Card

Bar secures payloads in truck, trailer beds

The Holdit bar from Hunt-Davis is engineered to secure loads in the back of pickup trucks, trailers and vans within seconds.



The bar works with opposing screws to secure itself like a turnbuckle without springs. It is constructed of galvanized steel with right and left thread nuts and bolts for quick expansion. Neoprene pads on the ends provide cushion and add friction for a better hold.

It is installed by placing the bar where desired and twisting to the necessary compression, which ranges between 600 and 800 psi without the help of tools. According to the company, this is adequate to secure a load between 800 and 1,250 pounds.

Circle No. 195 on Reader Inquiry Card

Helper springs smooth out light truck ride

Ride-Rite air-adjustable helper springs from Firestone Industrial Products are mounted between the frame and axle of the vehicle.

As payload is added to the truck, the inflatable springs can be pressurized to level the load both front-to-back and side-to-side. The suspension assist springs come complete with a kit for do-it-yourself installation.

Circle No. 196 on Reader Inquiry Card

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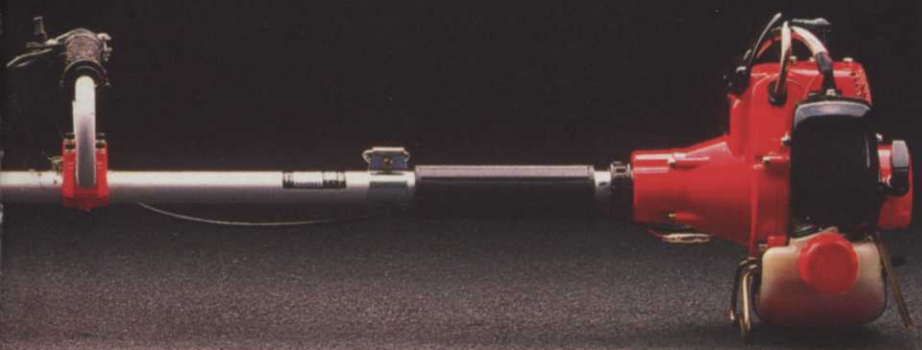

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Circle No. 266 on Reader Inquiry Card

SOILS *from page 79*

Soil texture and rooting depth effects on water available to turf.

Texture	Available soil water, inches		
	Rooting depth		
	12 inches	6 inches	2 inches
Medium sand	0.4	0.20	.07
Fine sand	0.7	0.35	.12
Loamy sand	1.0	0.50	.17
Sandy loam	1.3	0.65	.21
Loam	1.8	0.90	.30
Silt loam	2.4	1.20	.40
Clay loam	2.2	1.10	.36
Clay	1.9	0.95	.31

precisely through modeling, we are already able to reduce the use of chemicals for certain diseases. This should help us reduce pesticide use. Using biological pest control will further reduce our dependence on chemicals, though some use of chemicals will surely be necessary in the future.

The residue of chemical applications ends up in the soil for the most part. Thus, when using pesticides, knowledge of soil effects on their longevity and activity is important. Maintaining a "high" level of activity of the desired organisms in the soil should be the objective of biological soil management.

Theoretically, this should limit the activity of the undesired organisms. The question is, how can this be accomplished?

We know that proper pH, moisture, oxygen and food sources are needed for soil microorganisms to be active. In this regard, using sand provides a medium less conducive to maintaining desired organisms. Extensive use of certain pesticides may control the target organism(s); but questions can be raised about how they affect non-target organisms.

Little research has been conducted on these effects. But work by Joe Vargas, Ph.D, and his staff at Michigan State University indicates that some organic materials amended with selected organisms can reduce activity of certain diseases. And our work indicates that thatch may be reduced by applying certain organic products. It is clear, then, that enhancing desired biological activities with selected products offers great promise.

The turf/soil environment is a very dynamic and complex system. Knowledge of the soil's physical, chemical and biological properties and how they interact with each other and the turf can help us make better management decisions. The result should be better quality and more stress-tolerant turf. **LM**

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PROBLEM MANAGEMENT

by **Balakrishna Rao,** Ph.D.

In-between fertilization

Problem: *Besides fall and spring fertilization, how often should you fertilize turfgrass in between? (Washington D.C.)*

Solution: An important objective of turfgrass fertilization should be to build carbohydrate reserves and promote root development. Richard Rathjens, senior agronomist at Davey, recommends that a fertilizer program emphasize fall (September-early October) and late fall (time of last mowing of season) applications of fertilizer for cool-season turfgrasses (depending on the area). If a season-long turf of optimum appearance is desired, fall and late fall treatments will need to be supplemented with spring and summer fertilization.

Spring and summer treatments should apply only enough fertilizer to maintain color and density without promoting succulent growth. The annual rate of nitrogen may vary from 2 to 8 lbs./1,000 sq. ft., depending on the species, length of growing season, levels of quality desired, purpose for which turf is used and cultural practices. However, many lawn care companies in your area use approximately 4 lbs./1,000 sq. ft. in four to five applications per season and are able to provide the color and density desired by their customers.

Betasan control

Problem: *Many of our lawn care customers have a rich organic loam soil, and because of this our pre-emergent (Betasan) doesn't do a good job of controlling crabgrass. Do you know of any other products that may be able to help us with this situation? (Wisconsin)*

Solution: Stauffer Chemical, the manufacturer of Betasan, indicated in its publication that, "Betasan is more residual in clay soils high in organic matter than in predominately sandy soils or sandy loams." Based on this information, it is difficult to believe that soils rich in organic loam content are the cause of poor results with Betasan.

The Lescosan label (same as Betasan) suggests not to apply peatmoss to lawns or ground covers before applying Lescosan. However, it is difficult to believe that your soils contain so much organic matter to deactivate the pre-emergence material.

Consider the following possible contributing factors for poor performance—pH hydrolysis, photodegradation of pre-emergent in lawns, mechanical disturbance of chemical barrier after pre-emergence material application, poor timing, and amount of moisture received after application (reports suggest

continued on page 90

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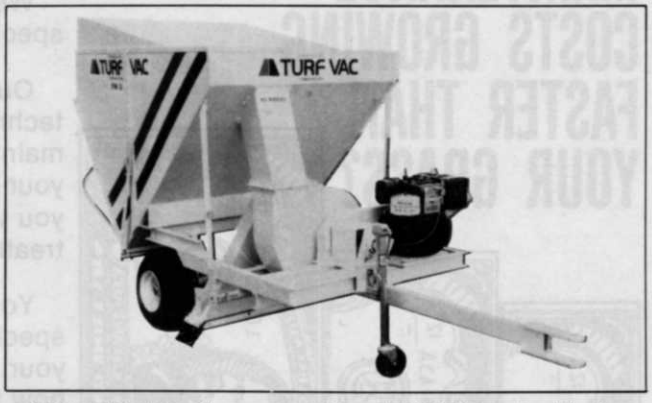

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Circle No. 153 on Reader Inquiry Card

MANAGEMENT *from page 86*

that light irrigation after treatment would improve effectiveness).

Poor crabgrass control was reported in many areas of the U.S. last year, presumably due to the environmental conditions, since several pre-emergence herbicides were used.

As far as other products, consider using pre-emergence material like Pre-M or Dacthal, and make sure that the conditions for crabgrass control are ideal. Read and follow label specifications.

More on moss

Problem: *The August issue of* LANDSCAPE MANAGEMENT *contains an article on "Managing Moss." I was a bit surprised to learn that moss grows in both acid and alkaline soil. My confusion comes from the fact that one of my professors at a local agricultural school has a lawn completely grown of moss. He has always advocated the use of copper sulfate to promote the growth of his moss by making the soil more sour or acidic. My only conclusion is that his moss is a type best suited for acidic conditions. However, the article suggests that copper sulfate inhibits moss growth. Could you please clear this up? (Pennsylvania)*

Solution: Infestation of moss is generally associated with factors such as low fertility, poor drainage, too much shade, soil compaction, wet conditions, poor air circulation or a combination of these factors. Contrary to popular opinion, low soil pH is seldom responsible for moss establishment. Most moss species grow under a wide range of soil pH.

There are more than 13,000 types of mosses, with about 50 common to your area. Some appear to be associated with acidic soil and others associated with alkaline soil conditions.

Copper sulfate is one of the products recommended for managing the moss problem, although copper sulfate alone will not take care of it. Along with treatments, other contributing factors should be corrected to minimize moss growth.

I am not sure how this treatment would promote moss growth. One explanation is that moss is growing in an area where it can flourish and establish well. Perhaps the growing conditions were very conducive for moss growth in the property questioned. The soil might have been alkaline to start with and response to copper sulfate treatment was not very visible.

Balakrishna Rao is Director of Lawn Care Technical Resources for The Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, Landscape Management, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

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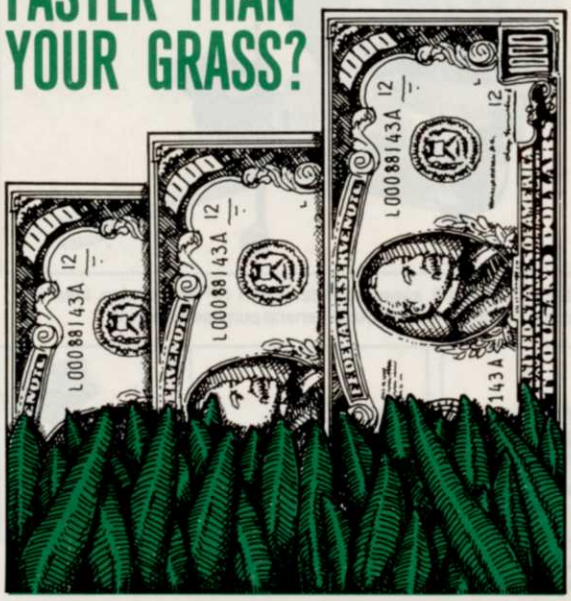

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LANDSCAPE ARCHITECT/SALESMAN - An established, reputable, growing Cleveland landscaping firm is seeking a highly motivated, aggressive individual. Excellent opportunities for career advancement. Professional wages and benefits year-round. Incentive bonus. Send resume with experience and salary history in confidence to Emerallawn, 35144 Lakeland Boulevard, Eastlake, OH 44094. 4/88

LANDSCAPE EMPLOYMENT OPPORTUNITIES - One of the Midwest's largest commercial landscape contracting and maintenance firms seeks motivated, quality individuals to fill the following positions: Landscape Maintenance Supervisors, Estimators/Contract Administrator, Landscape Materials Buyer, Foremen, Pesticide Applicators. Excellent salary and benefit package. Send resume to: Reinhold Landscape, 23216 Telegraph, Flat Rock, MI 48134. 4/88

Commercial Landscape Contractor in Chicago suburbs seeks an individual for its estimating staff. Applicant must have excellent mathematical aptitude, ability to read and interpret landscape plans, and compatibility with computer and horticultural knowledge. Please send resume with cover letter to Otto Damgaard Sons, P.O. Box 182, Des Plaines, IL 60016. Attention Valarie Shepard. 4/88

We are looking for a Landscape Foreman with experience in leading and working with installation crews. Duties include job estimating, reading blueprints, staking jobs, and pruning. We are located in the heart of the Blue Grass State of Kentucky. Family owned business since 1841. Benefits include paid vacation after 1 year, health insurance plus profit sharing. Your salary is negotiable depending on experience. Contact Stephen Hillenmeyer, C/O Hillenmeyer Nursery, 2370 Sandersville Road, Lexington, KY 40511. 4/88

Design/Sales/Management - Growing suburban Detroit landscape firm is seeking individual with knowledge in design, construction, sales, and management. Individual will oversee development of large commercial to small residential projects. Excellent opportunities available for career advancement. Salary and benefits commensurate with ability and experience. Send resume to: Danielson & Associates, Inc., P.O. Box 654, Highland, MI 48031. 4/88

TREE CARE SALESPERSON - B.S. degree preferred in Urban Forestry, Horticulture or related field. We offer Medical Plan, Profit Sharing, Savings Plan and Paid Vacation. Send resume with pay history to Ira Wickes - Arborists, 11 McNamara Road, Spring Valley, NY 10977, 914-354-3400, attention John. 5/88

AGRONOMIST - Lawn Doctor, the nations leader in franchise lawn care, is seeking an individual to join our national staff. Position involves working with franchises on turf program development, training, safety, and regulation. BS Agronomy with warm and cool season turf experience and strong communication skills required. Must be willing to travel and relocate. Resume and salary history to Lawn Doctor, P.O. Box 512, Matawan, NJ 07747. 4/88

LANDSCAPE MAINTENANCE SUPERVISOR - Established landscape firm seeking experienced field supervisors for our rapidly expanding professional staff. Full benefits. Forward your resume to Tandem Landscape Company, 33W480 Fabyan Parkway, Suite 101, West Chicago, Illinois 60185. Attention: Glenn Kedzie. Or call (312) 232-1700. 4/88

Landscape Maintenance Operation Manager - Florida's fastest growing landscape maintenance firm with operations in 3 cities is looking for an experienced, quality conscience maintenance professional. Applicants must have proven management ability, ability to communicate well with clients and employees and strong technical background. Opportunity for growth and responsibility advancement. Excellent salary and benefits. Call Mr. Khalsa at 305-831-8101. 6/88

HELP WANTED

GROUNDS MANAGER - Well established, quality conscious, real estate development and management firm requires full time Grounds Operation Manager for all seasons management of large corporate office parks located primarily in the lower Connecticut/Westchester/Putnam, New York area. **Applicant** must have minimum five years experience in care and management of trees, shrubs, turf and pavement. Knowledge of and ability to administrate contracts. A working knowledge of site work and irrigation systems. Individual must have good communication skills and ability to deal with labor as well as executive staff. **Growth position.** Salary open. Send resume and salary requirements to: Grounds Management, Box 269, 324 Main Street, Norwalk, Connecticut 06851. 5/88

LANDSCAPE MAINTENANCE SUPERVISOR: Scapes, Inc., a commercial landscape firm in Atlanta, Georgia, is seeking an individual who has strong management skills, as well as, extensive landscaping experience and knowledge of plants. Advancement potential — up to Division Manager — makes this position ideal for a goal oriented individual. 404-956-7500. TF

SALES MANAGER - A very aggressive person currently active as sales manager is needed to develop sales for an established and progressive (design/build landscape firm located in the Chicago western suburbs) firm. This person will work closely with a principal of the firm and eventually take over the top management position of vice president in charge of sales. Good salary. Compensation package tied to performance. Equity/ownership possible for the right person. We are interested in only experienced highly motivated professional individuals. Send resume to LM Box 447. TF

LAWN CARE PROFESSIONAL: Commercial landscape firm looking for responsible person to start up lawn care division. Responsibilities to include applications, service calls, record keeping, training and inventory. Prefer B.S. in Agronomy or at least 2 years field experience. Generous wage & benefits package. Send resume to Hunt & Hulteen, Inc., 50 Spark Street, Brockton, MA 02402. (1-617-580-1062). 4/88

TRAINEES & FOREMEN: Washington D.C. area design-build firm is looking for career minded individuals who want to learn top of the line residential landscaping-construction, planting & landscape maintenance. We need professionals who are willing to work and can produce. We work a 4-5 day week and offer good pay with benefits. Send resume with references to: Garden Gate Landscaping, 821 Norwood Road, Silver Springs, MD 20904. Attn: Jim Seipel. 4/88

PERSONNEL: Hydro Lawn, a Mid-Atlantic full service lawn care company is accepting applications for Sales/Customer Service management positions. Applicants must be aggressive, responsible, neat and experienced in sales/customer service. Compensation from $25-35,000 plus full benefit package. Send resume to: Hydro Lawn, Inc., 7905 Airpark Road, Gaithersburg, Maryland 20879. TF

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CREW SUPERINTENDENTS: Houston, TX. We are looking for experienced, aggressive people to grow with us. Send resume and salary history to: **THE GROUND CREW, INC., P.O. BOX 219041, HOUSTON, TX 77218.** Or just call me collect. Stuart Scandridge, 713-578-9519. 4/88

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WANTED - Aggressive Manufacturer's Reps - Manufacturer of agricultural, golf course, municipal and lawn & garden spraying equipment is seeking qualified reps with experience in sprayer sales. Seeking nationwide network, exclusive territory contract, excellent technical support and top of the line equipment. Send resume and current line card to: The Broyhill Company, P.O. Box 475-CB, Dakota City, NE 68731-0475. Phone: 1-800-228-1003. 5/88

OLD WESTBURY GARDENS is seeking applications for experienced gardeners in the areas of 1) general landscape maintenance; 2) cutting garden planning, planting and maintenance; and 3) herbaceous perennial maintenance. Salary commensurate with experience. Contact Robert Bowden, Director, Horticulture and Operations, Box 430, Old Westbury, NY 11568. Call (516) 333-0048. Available immediately. 4/88

Landscape Supervisor: Established Michigan Contractor looking for self-motivated individual with 5 years minimum experience to manage crews and oversee landscape installation. Send resume and salary requirements to: DeAngelis Landscape Incorporated, 22425 Van Horn Road, Woodhaven, Michigan 48183. 4/88

PRODUCTION/SALES/MANAGEMENT — Aggressive Texas full-service landscape firm now accepting resumes for entry level positions in sales, production and management. Excellent opportunities for career, growth oriented persons. Send full resume to LM Box 443. 4/88

Landscape Salesperson position available with Yardmaster, Inc. in Cleveland, Ohio. Excellent compensation plan and benefits. Join Ohio's largest design/build and maintenance firm. Send resume or call **YARDMASTER, INC., 1447 N. Ridge RD., PAINESVILLE, OH 44077, 216-357-8400.** 4/88

Florida Landscape Contractor in business 15 years, has an opening for an experienced landscape architect or highly qualified sales person to handle design build sales and business development. Applicant must be a self-starter and possess strong sales skills. Unlimited potential in a growing firm with a top notch track record. Contact Mr. Singh (305) 831-8101. 5/88

CITY FORESTER. The City of Burlington, Iowa (pop. 29,500) is seeking an individual to supervise, administer and participate in forestry activities on city right-of-ways and city parks. Duties also include supervisory work and park maintenance. Degree in forestry or related fields from a 2 or 4 year college required. Experience in trimming and removal of trees required. Salary range: $20,700-26,900. Full benefit package. Send resume to Personnel Department, City Hall, 4th and Washington, Burlington, IA 52601 by April 30, 1988. The City of Burlington does not discriminate on the basis of race, color, national origin, sex, religion, age or handicapped status in employment or the provision of services. 4/88

TREE CLIMBERS/BUCKET OPERATORS/ STUMP GRINDER OPERATORS Large landscape company needs reliable employees. Excellent wages and benefits for career-minded individuals with two years experience supervising and motivating people. Send resume to Rood Landscape Co., P.O. Drawer 1568, Jupiter, FL 33468-1568 or Phone (305) 746-5186. 4/88

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Established Central Florida landscape contractor has an opening for a highly qualified operations manager for its maintenance division. Ability to schedule, organize and manage people in a rapidly growing organization. Heavy field experience and a commitment to quality work required. Opportunity for an aggressive person to be a key member of a top-notch team. Excellent salary and benefits. Call Mr. Singh (305) 831-8101. 5/88

Landscape Maintenance: Excellent opportunity for career, goal oriented individual to head commercial maintenance division. Must be experienced and willing to assume total responsibility. Send resume with salary history to Bill Pudifin, RJ Sunday Landscaping, Inc., 4311 Church Rd., Mitchellville, MD 20715. All replies will be held in strictest confidence. 5/88

GROUND MAINTENANCE AND PLANTING SUPERVISOR/FOREMAN: Well established landscape contractor in the Philadelphia area is seeking experienced quality supervisors and/or foremen to fill various positions. Salary and benefits commensurate with experience. Forward resume to: Personnel Office, Heyser Landscaping, Inc., 400 N. Park Ave., Norristown, PA 19403. 4/88

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